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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2021–0015; FF09E21000 FXES11110900000 212]

RIN 1018–BB27

Endangered and Threatened Wildlife and Plants; Lesser Prairie-Chicken; Threatened Status with Section 4(d) Rule for the Northern Distinct Population Segment and Endangered Status for the Southern Distinct Population Segment

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list two Distinct Population Segments (DPSs) of the lesser prairie-chicken (*Tympanuchus pallidicinctus*), a grassland bird known from southeastern Colorado, western Kansas, eastern New Mexico, western Oklahoma, and the Texas Panhandle under the Endangered Species Act of 1973, as amended (Act). This determination also serves as our 12-month finding on a petition to list the lesser prairie-chicken. After a review of the best available scientific and commercial information, we find that listing the Southern DPS as endangered is warranted, and that listing the Northern DPS as threatened is warranted. Accordingly, we propose to list the Southern DPS as an endangered species under the Act and the Northern DPS as a threatened species with a rule issued under section 4(d) of the Act ("4(d) rule"). If we finalize this rule as proposed, it will add these two DPSs to the List of Endangered and Threatened Wildlife and extend the Act's protections to them. We also are notifying the public that we have scheduled informational meetings followed by public hearings on the proposed rule.

DATES: We will accept comments received or postmarked on or before [INSERT

DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]. Comments submitted electronically using the Federal eRulemaking Portal (see **ADDRESSES**, below) must be received by 11:59 p.m. Eastern Time on the closing date. We must receive requests for a public hearing, in writing, at the address shown in **FOR FURTHER INFORMATION CONTACT** by [INSERT DATE 45 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Public informational meeting and public hearing: We will hold a public informational session from 5 p.m. to 6 p.m., Central Time, followed by a public hearing from 6:30 p.m. to 8:30 p.m., Central Time, on July 8, 2021. We will hold a second public informational session from 5 p.m. to 6 p.m., Central Time, followed by a public hearing from 6:30 p.m. to 8:30 p.m., Central Time, on July 14, 2021.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically*: Go to the Federal eRulemaking Portal: *http://www.regulations.gov*. In the Search box, enter FWS–R2–ES–2021–0015, which is the docket number for this rulemaking. Then, click on the Search button. On the resulting page, in the Search panel on the left side of the screen, under the Document Type heading, check the Proposed Rule box to locate this document. You may submit a comment by clicking on "Comment Now!"

(2) *By hard copy*: Submit by U.S. mail to: Public Comments Processing, Attn: FWS–R2–ES–2021–0015, U.S. Fish and Wildlife Service, MS: PRB/3W, 5275 Leesburg Pike, Falls Church, VA 22041–3803.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov*. This generally means that we will post any personal information you provide us (see **Information Requested**, below, for more information).

Public informational meeting and public hearing: The public informational meetings and

the public hearings will be held virtually using the Zoom platform. See Public Hearing, below, for more information.

FOR FURTHER INFORMATION CONTACT: Debra Bills, Field Supervisor, Arlington Ecological Services Field Office, 2005 NE Green Oaks Blvd. Suite 140, Arlington, TX 76006; telephone 817–277–1129. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Act, if we determine that a species is an endangered or threatened species throughout all or a significant portion of its range, we are required to promptly publish a proposal in the *Federal Register* and make a determination on our proposal within 1 year. To the maximum extent prudent and determinable, we must designate critical habitat for any species that we determine to be an endangered or threatened species under the Act. Listing a species as an endangered or threatened species and designation of critical habitat can only be completed by issuing a rule.

What this document does. We propose the listing of the Northern DPS of the lesser prairie-chicken as a threatened species with a rule under section 4(d) of the Act and the Southern DPS of the lesser prairie-chicken as an endangered species under the Act.

The basis for our action. Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence. We make these determinations solely on the basis of the best scientific and commercial data available

after conducting a review of the status of the species and after taking into account those efforts being made to protect the species.

We have determined that both the northern and southern parts of the lesser prairie-chicken's range are discrete and significant under our DPS Policy and are, therefore, listable entities under the Act. The Southern DPS consists of the Shinnery Oak Ecoregion in New Mexico and Texas, and the Northern DPS consists of the Sand Sagebrush Ecoregion, the Mixed Grass Ecoregion, and the Short Grass/Conservation Reserve Program (CRP) Ecoregion in Texas, Oklahoma, Colorado, and Kansas. These two DPSs together encompass the entirety of the lesser prairie-chicken's range. The primary threat impacting both DPSs is the ongoing loss of large, connected blocks of grassland and shrubland habitat. The Southern DPS has low resiliency, redundancy, and representation and is particularly vulnerable to severe droughts due to being located in the dryer and hotter southwestern portion of the range. Because the Southern DPS is currently at risk of extinction, we propose to list it as endangered.

In the Northern DPS, as a result of habitat loss and fragmentation, resiliency has been much reduced across two of the ecoregions in the Northern DPS when compared to historical conditions. However, this DPS still has redundancy across the three ecoregions and genetic and environmental representation. We expect habitat loss and fragmentation across the Northern DPS to continue into the foreseeable future, resulting in even further reduced resiliency. Because the Northern DPS is at risk of extinction in the foreseeable future, we propose to list it as threatened.

Peer review. In accordance with our joint policy on peer review published in the *Federal Register* on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we sought the expert opinions of 6 appropriate specialists regarding the species status assessment (SSA) report. We received responses from 4 specialists, which informed the proposed

listing rule. The purpose of peer review is to ensure that our listing determinations and 4(d) rules are based on scientifically sound data, assumptions, and analyses. The peer reviewers have expertise in the biology, habitat, and threats to the species.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from other governmental agencies, Native American Tribes, the scientific community, industry, or any other interested parties concerning this proposed rule.

We particularly seek comments concerning:

(1) The species' biology, range, and population trends, including:

(a) Biological or ecological requirements of the species, including habitat requirements for feeding, breeding, and sheltering;

(b) Genetics and taxonomy;

(c) Historical and current range, including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for the species, its habitat, or both.

(2) Factors that may affect the continued existence of the species, which may include habitat modification or destruction, overutilization, disease, predation, the adequacy of existing regulatory mechanisms, or other natural or manmade factors.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to this species and existing conservation measures and regulations that may be addressing those threats.

(4) Additional information concerning the historical and current status, range, distribution, and population size of this species, including the locations of any additional populations of this species.

(5) Information on regulations that are necessary and advisable to provide for the conservation of the Northern DPS of the lesser prairie-chicken and that the Service can consider in developing a 4(d) rule for the DPS. In particular, information concerning the extent to which we should include any of the prohibitions associated with section 9 in the 4(d) rule or whether any other forms of take should be excepted from the prohibitions in the 4(d) rule.

(6) Information on whether an exception from the prohibitions associated with section 9 should be included in the 4(d) rule for the Northern DPS for industry and/or landowner participants who are enrolled in and operating in compliance with the mitigation framework included in the Range-Wide Conservation Plan for the Lesser Prairie-Chicken being administered by the Western Association of Fish and Wildlife Agencies but who do not have incidental take coverage via the companion Candidate Conservation Agreement with Assurances covering oil and gas activities.

(7) Which areas would be appropriate as critical habitat for the species and why areas should or should not be proposed for designation as critical habitat in the future, including whether there are threats to the species from human activity that would be expected to increase due to the designation and whether that increase in threat would outweigh the benefit of designation such that the designation of critical habitat may not be prudent.

(8) Specific information on:

(a) The amount and distribution of habitat for the lesser prairie-chicken which should be considered for proposed critical habitat;

(b) What may constitute “physical or biological features essential to the conservation of the species within the geographical range currently occupied by the species”;

(c) Where these features are currently found;

(d) Whether any of these features may require special management considerations or practices;

(e) What areas are currently occupied and contain features essential to the conservation of the species should be included in the designation and why; and

(f) What unoccupied areas are essential for the conservation of the species and why. Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for, or opposition to, the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is an endangered or a threatened species must be made "solely on the basis of the best scientific and commercial data available."

You may submit your comments and materials concerning this proposed rule by one of the methods listed in **ADDRESSES**. We request that you send comments only by the methods described in **ADDRESSES**.

If you submit information via *http://www.regulations.gov*, your entire submission—including any personal identifying information—will be posted on the website. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov*.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov*.

Because we will consider all comments and information we receive during the comment period, our final determinations may differ from this proposal. Based on the new information we receive (and any comments on that new information), we may conclude that the Southern DPS is threatened instead of endangered, or that the Northern DPS is endangered instead of threatened, or we may conclude that either DPS does not warrant listing as either an endangered species or a threatened species. In addition, we may change the parameters of the prohibitions or the exceptions to those prohibitions in the 4(d) rule for the Northern DPS if we conclude it is appropriate in light of comments and new information received. For example, we may expand the incidental-take prohibitions or the exceptions to those prohibitions in the 4(d) rule for the Northern DPS to include prohibiting additional activities if we conclude that those additional activities are not compatible with conservation of the species. Conversely, we may establish additional exceptions to the incidental-take prohibitions in the final rule if we conclude that the activities would facilitate or are compatible with the conservation and recovery of the species.

List of Acronyms

We use many acronyms in this proposed rule. For the convenience of the reader, we define some of them here:

ACEC = Area of Critical Environmental Concern

BLM = Bureau of Land Management

CI = confidence interval

CCAA = candidate conservation agreement with assurances

CCA/A= candidate conservation agreement and candidate conservation agreement with assurances

CPW = Colorado Parks and Wildlife

CRP = Conservation Reserve Program

DPS = Distinct Population Segment

KDWPT = Kansas Department of Wildlife, Parks and Tourism

LPCI = Lesser Prairie-Chicken Initiative

LPN = Listing Priority Number

NRCS = Natural Resources Conservation Service

ODWC = Oklahoma Department of Wildlife Conservation

PFW = the Service's Partners for Fish and Wildlife Program

RMPA = Resource Management Plan Amendment

RWP = Lesser Prairie-Chicken Range-wide Conservation Plan

SSA = Species Status Assessment

TPWD = Texas Parks and Wildlife Department

USFS = U.S. Forest Service

WAFWA = Western Association of Fish and Wildlife Agencies

Previous Federal Actions

In 1973, the Service's Office of Endangered Species published a list of threatened wildlife of the United States in Resource Publication 114, often referred to as the "Red Book." While this publication did not, by itself, provide any special protections, it served in part to solicit additional information regarding the status of the identified taxa. The lesser prairie-chicken was one of 70 birds included in this publication (Service 1973, pp. 134–135), but little Federal regulatory action occurred on the lesser prairie-chicken until 1995.

On October 6, 1995, we received a petition, dated October 5, 1995, from the Biodiversity Legal Foundation, Boulder, Colorado, and Marie E. Morrissey (petitioners). The petitioners requested that we list the lesser prairie-chicken as threatened throughout its known historical range in the United States. The petitioners also requested that critical habitat be designated as soon as the needs of the species are sufficiently well known.

However, from October 1995 through April 1996, we were under a moratorium on listing actions as a result of Public Law 104–6, which, along with a series of continuing budget resolutions, eliminated or severely reduced our listing budget through April 1996. We were unable to act on the petition during that period.

On July 8, 1997 (62 FR 36482), we announced our 90-day finding that the petition presented substantial information indicating that the petitioned action may be warranted. We subsequently published our 12-month finding for the lesser prairie-chicken on June 9, 1998 (63 FR 31400), concluding that the petitioned action was warranted but precluded by other higher priority listing actions. This 12-month finding identified the lesser prairie-chicken as a candidate for listing with a listing priority number (LPN) of 8, indicating that the magnitude of threats was moderate and the immediacy of the threats to the species was high.

On January 8, 2001 (66 FR 1295), we published our resubmitted petition findings for 25 animal species, including the lesser prairie-chicken, having outstanding "warranted-but-precluded" petition findings as well as notice of one candidate removal. The lesser prairie-chicken remained a candidate with an LPN of 8 in our October 30, 2001 (66 FR 54808); June 13, 2002 (67 FR 40657); May 4, 2004 (69 FR 24876); May 11, 2005 (70 FR 24870); September 12, 2006 (71 FR 53756); and December 6, 2007 (72 FR 69034) candidate notices of review. In our December 10, 2008 (73 FR 75176), candidate notice of review, we changed the LPN for the lesser prairie-chicken from an 8 to a 2. This change in LPN reflected a change in the magnitude of the threats from moderate to high primarily due to an anticipated increase in the development of wind energy and associated placement of transmission lines throughout the estimated occupied range of the lesser prairie-chicken. Our November 9, 2009 (74 FR 57804), November 10, 2010 (75 FR 69222), and October 26, 2011 (76 FR 66370) candidate notices of review retained an LPN of 2 for the lesser prairie-chicken.

After making our 12-month finding in 1998, we received several 60-day notices of intent to sue from WildEarth Guardians (formerly Forest Guardians) and several other parties for failure to make expeditious progress toward listing of the lesser prairie-chicken. WildEarth Guardians subsequently filed suit on September 1, 2010, in the U.S. District Court for the District of Colorado.

In 2011, the Service entered into a settlement agreement with WildEarth Guardians that impacted multiple cases nationwide (In re Endangered Species Act Section 4 Deadline Litigation, No. 10–377 (EGS), MDL Docket No. 2165 (D.D.C. May 10, 2011)). As relevant to the lesser prairie-chicken, the agreement required the Service to submit a proposed listing rule for the lesser prairie-chicken to the *Federal Register* for publication by September 30, 2012.

On September 27, 2012, the settlement agreement was modified to require that the proposed listing rule be submitted to the *Federal Registe*r on or before November 29, 2012. On December 11, 2012, we published a proposed rule (77 FR 73828) to list the lesser prairie-chicken as a threatened species under the Act (16 U.S.C. 1531 et seq.). On May 6, 2013, we announced the publication of a proposed 4(d) rule under the authority of section 4(d) of the Act (78 FR 26302).

On July 9, 2013, we announced a 6-month extension (78 FR 41022) of the final listing determination based on our finding that there was substantial disagreement regarding the sufficiency or accuracy of the available data relevant to our determination regarding the proposed listing rule.

On April 10, 2014, we published a final rule listing the lesser prairie-chicken as a threatened species under the Act (79 FR 19973) and concurrently published a final 4(d) rule for the lesser prairie-chicken (79 FR 20073). However, on September 1, 2015, the final listing rule for the lesser prairie-chicken was vacated by the United States District Court for the Western District of Texas, which also mooted the final 4(d) rule. On July

20, 2016, the Service published in the *Federal Register* a final rule that removed the lesser prairie-chicken from the List of Endangered and Threatened Wildlife in accordance with the court decision (81 FR 47047).

On September 8, 2016, we received a new petition from WildEarth Guardians, Defenders of Wildlife, and Center for Biological Diversity to list the lesser prairie-chicken as endangered throughout its entire range or in three distinct population segments (Molvar 2016, entire). On November 30, 2016, we published a 90-day petition finding that concluded that the petition to list the lesser prairie-chicken provided substantial information that the petitioned action may be warranted (81 FR 86315). On June 12, 2019, the petitioners filed their complaint with the court alleging the Service failed to complete the 12-month petition finding for the lesser prairie-chicken. On September 12, 2019, the Service and the plaintiffs entered into a stipulated settlement agreement that the Service would submit a 12-month petition finding to the *Federal Register* no later than May 26, 2021. This 12-month finding completes the Service's obligations under that settlement agreement.

Supporting Documents

An SSA team prepared an SSA report for the lesser prairie-chicken. The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species. The Service sent the SSA report to six independent peer reviewers and received four responses. The Service also sent the SSA report to the five State fish and wildlife agencies within the range of the lesser prairie-chicken (Colorado, Kansas, New Mexico, Oklahoma, and Texas) and the four primary Federal agencies with whom we work to deliver conservation actions that could benefit the lesser prairie-chicken: the Bureau of Land Management (BLM), the

Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), and U.S. Forest Service (USFS). These partners include scientists with expertise in management of either the lesser prairie-chicken or the habitat upon which the lesser prairie-chicken depends. We received responses from USFS, BLM, and all five of the State wildlife agencies. Comments and feedback from partners and peer reviewers were incorporated into the SSA report as appropriate and have informed this proposed rule.

I. Proposed Listing Determination

Background

Below is a summary of the taxonomy, life history, and ecology of the lesser prairie-chicken; for a thorough review, please see the SSA report (version 2.2; Service 2021, pp. 5–14).

The lesser prairie-chicken is in the order Galliformes, family Phasianidae, subfamily Tetraoninae; it is generally recognized as a species separate from the greater prairie-chicken (*Tympanuchus cupido pinnatus*) (Jones 1964, pp. 65–73; American Ornithologist's Union 1998, p. 122).

Most lesser prairie-chicken adults live for 2 to 3 years and reproduce in the spring and summer (Service 2021, pp. 10–12). Males congregate on leks during the spring to attract and mate with females (Copelin 1963, p. 26; Hoffman 1963, p. 730; Crawford and Bolen 1975, p. 810; Davis et al. 1979, p. 84; Merchant 1982, p. 41; Haukos 1988, p. 49). Male prairie-chickens tend to exhibit strong breeding site fidelity, often returning to a specific lek many times, even in cases of declining female attendance and habitat condition (Copelin 1963, pp. 29–30; Hoffman 1963, p. 731; Campbell 1972, pp. 698–699, Hagen et al. 2005, entire, Harju et al. 2010, entire). Females tend to establish nests relatively close to the lek, commonly within 0.6 to 2.4 mi (1 to 4 km) (Copelin 1963, p. 44; Giesen 1994, p. 97), where they incubate 8 to 14 eggs for 24 to 27 days and then raise broods of young throughout the summer (Boal and Haukos 2016, p. 4). Some females

will attempt a second nesting if the first nest fails (Johnsgard 1973, pp. 63–64; Merchant 1982, p. 43; Pitman et al. 2006, p. 25). Eggs and young lesser prairie-chickens are susceptible to natural mortality from environmental stress and predation. The appropriate vegetative community and structure is vital to provide cover for nests and young and to provide food resources as broods mature into adults (Suminski 1977, p. 32; Riley 1978, p. 36; Riley *et al*. 1992, p. 386; Giesen 1998, p. 9). For more detail on habitat needs of the lesser prairie-chicken, please see the SSA report (Service 2021, pp. 9–14).

The lesser prairie-chicken once ranged across the Southern Great Plains of Southeastern Colorado, Southwestern Kansas, Western Oklahoma, the Panhandle and South Plains of Texas, and Eastern New Mexico; currently, it occupies a substantially reduced portion of its presumed historical range (Rodgers 2016, p. 15). Estimates of the potential maximum historical range of the lesser prairie-chicken (e.g., Taylor and Guthery 1980a, p. 1, based on Aldrich 1963, p. 537; Johnsgard 2002, p. 32; Playa Lakes Joint Venture 2007, p. 1) range from about 64–115 million acres (ac) (26–47 million hectares (ha)). The more recent estimate of the historical range of the lesser prairie-chicken encompasses an area of approximately 115 million ac (47 million ha). Presumably, not all of the area within this historical range was evenly occupied by lesser prairie-chicken, and some of the area may not have been suitable to regularly support lesser prairie-chicken populations (Boal and Haukos 2016, p. 6). However, the current range of the lesser prairie-chicken has been significantly reduced from the historical range at the time of European settlement. Estimates as to extent of the loss vary from greater than 90 percent reduction (Hagen and Giesen 2005, unpaginated) to approximately 83 percent reduction (Van Pelt et al. 2013, p. 3).

Lesser prairie-chicken monitoring has been occurring for multiple decades and have included multiple different methodologies. Estimates of population abundance prior to the 1960s are indeterminable and rely almost entirely on anecdotal information (Boal

and Haukos 2016, p. 6). While little is known about precise historical population sizes, the lesser prairie-chicken was reported to be quite common throughout its range in the early 20th century (Bent 1932, pp. 280–281, 283; Baker 1953, p. 8; Bailey and Niedrach 1965, p. 51; Sands 1968, p. 454; Fleharty 1995, pp. 38–44; Robb and Schroeder 2005, p. 13). For example, prior to 1900, as many as two million birds may have existed in Texas alone (Litton 1978, p. 1). Information regarding population size is available starting in the 1960s when the State fish and wildlife agencies began routine lesser prairie-chicken monitoring efforts. However, survey methodology and effort have differed over the decades, making it difficult to precisely estimate trends.

The SSA report and this proposed rule rely on two main population estimates. The two methodologies largely cover different time periods, so we report the results of both throughout this proposed rule in order to give the best possible understanding of lesser prairie-chicken trends both recently and throughout the past decades.

The first of the two studies used historical lek surveys and population reconstruction methods to calculate historical trends and estimate male abundance from 1965 through 2016 (Hagen et al. (2017, pp. 6–9). We have identified concerns in the past with some of the methodologies and assumptions made in this analysis, and others have also noted the challenges of using these data for long-term trends (for example, Zavaleta and Haukos 2013, p. 545; Cummings et al. 2017, pp. 29–30). While these concerns remain, including the very low sample sizes particularly in the 1960s, this work represents the only attempt to compile the extensive historical ground lek count data collected by State agencies to estimate the number of males at both the range-wide and ecoregional scales, and represents the best available data for understanding historical population trends.

Following development of aerial survey methods (McRoberts et al. 2011b, entire), the second summary of lesser prairie-chicken population data uses more statistically

rigorous estimates of lesser prairie-chicken abundance (both males and females). This second study uses data from aerial line-transect surveys throughout the range of the lesser prairie-chicken; these results are then extrapolated from the surveyed area to the rest of the range (Nasman *et al*. 2020, entire). The results of these survey efforts should not be taken as precise estimates of the annual lesser prairie-chicken abundance, as indicated by the large confidence intervals. Thus, we caution the reader not to draw conclusions based upon annual fluctuations. Instead, we consider the best use of this data is for long-term trend analysis. Thus, in the SSA Report and this proposed rule, we report the population estimate for the current condition as the average of the past 5 years of surveys.

The results of the study using lek data (abundance of males) indicate that lesser prairie-chicken range-wide abundance (based on a minimum estimated number of male lesser prairie-chicken at leks) peaked from 1965–1970 at a mean estimate of about 175,000 males (Figure 1). The estimated mean population maintained levels of greater than 100,000 males until 1989, after which they steadily declined to a low of 25,000 males in 1997 (Garton *et al*. 2016, p. 68). The mean population estimates following 1997 peaked again at about 92,000 males in 2006, but subsequently declined to 34,440 males in 2012 (Figure 1).

The aerial survey results from 2012 through 2020 (Figure 2) estimated the lesser prairie-chicken population abundance, averaged over the most recent 5 years of surveys (2015-2020, no surveys in 2019), at 27,384 (90% confidence interval: 15,690, 59,981) (Nasman *et al*. 2020, p. 21; Table 3.3).

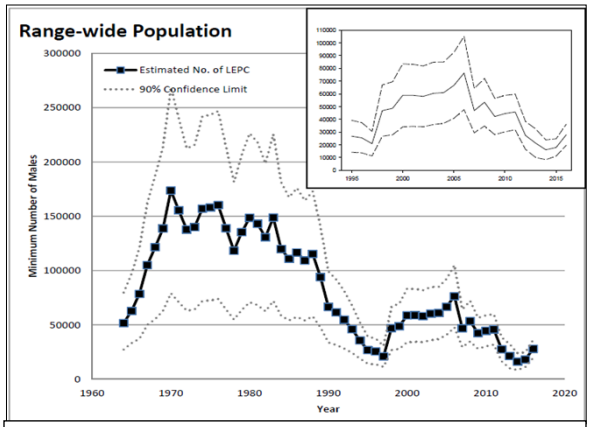


Figure 1. Estimated range-wide minimum number of Lesser Prairie-Chicken males attending leks 1964–2016 (90% confidence interval). Based on population reconstruction using 2016 aerial survey as the initial population size (reproduced from Hagen *et al.* 2017).

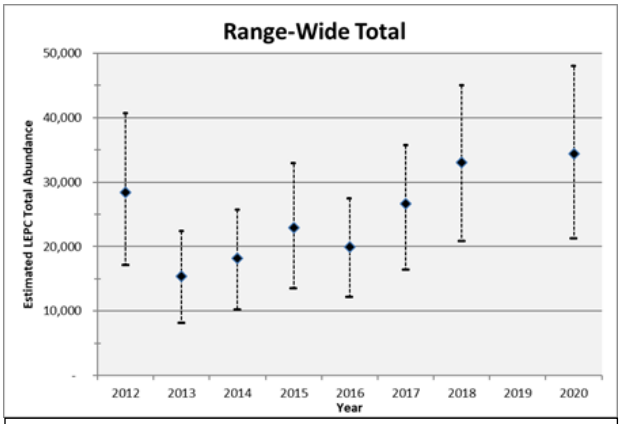


Figure 2. Annual estimates of total range-wide population size of lesser prairie-chicken from 2012–2020. Bars represent the bootstrapped 90% confidence intervals. Graph generated from Nasman *et al*. (2020, Table 12, p. 21). There were no surveys in 2019.

The preferred habitat of the lesser prairie-chicken is mixed-grass prairies and shrublands, with the exception of the Short-Grass/CRP Ecoregion where shrubs play a lesser role. Lesser prairie-chickens appear to select areas having a shrub component dominated by sand sagebrush or sand shinnery oak when those areas are available (Donaldson 1969, pp. 56, 62; Taylor and Guthery 1980a, p. 6; Giesen 1998, pp. 3–4). In the southern and central portions of the lesser prairie-chicken range, small shrubs, such as sand shinnery oak, have been reported to be important for summer shade (Copelin 1963, p. 37; Donaldson 1969, pp. 44–45, 62), winter protection, and as supplemental foods (Johnsgard 1979, p. 112), while in the Short-Grass/CRP Ecoregion, stands of grass that provide adequate vegetative structure likely serve the same roles. The absence of anthropogenic features as well as other vertical structures is important, as lesser prairie-chickens tend to avoid using areas with trees, vertical structures, and other disturbances in areas with otherwise adequate habitat conditions (Braun et al. 2002, pp. 11–13; Pruett et al. 2009, pp. 1256, 1258; Hovick et al. 2014a, p. 1685; Boggie et al. 2017, entire; Lautenbach 2017, pp. 104–142; Plumb et al. 2019, entire).

At the population scale, the most important requirement for the lesser prairie-chicken is having large, intact, ecologically diverse grasslands to complete their life

history and maintain healthy populations (Fuhlendorf et al. 2017b, entire). Historically, these ecologically diverse grasslands and shrublands were maintained by the occurrence of wildfires (keeping woody vegetation restricted to drainages and rocky outcroppings) and by grazing by bison and other large ungulates. The lesser prairie-chicken is a species that is area-sensitive; that is, it requires large, intact grasslands for functional self-sustaining populations (Giesen 1998, pp. 3–4; Bidwell et al. 2002, pp. 1–3; Hagen et al. 2004, pp. 71, 76–77; Haukos and Zavaleta 2016, p. 107).

The lesser prairie-chicken now occurs within four ecoregions (Figure 3); these ecoregions were originally delineated in 2012 as part of the aerial survey designed to monitor long-trends in lesser prairie-chicken populations. Each ecoregion is associated with unique environmental conditions based on habitat and climatic variables and some genetic differentiation (Boal and Haukos 2016, p. 5; Oyler-McCance et al. 2016, p. 653). These four ecoregions are the Short-Grass Prairie/CRP Mosaic Ecoregion in Kansas; the Sand Sagebrush Prairie Ecoregion in Colorado, Kansas, and Oklahoma; the Mixed-Grass Prairie Ecoregion in Kansas, Texas, and Oklahoma; and the Sand Shinnery Oak Prairie Ecoregion of New Mexico and Texas.

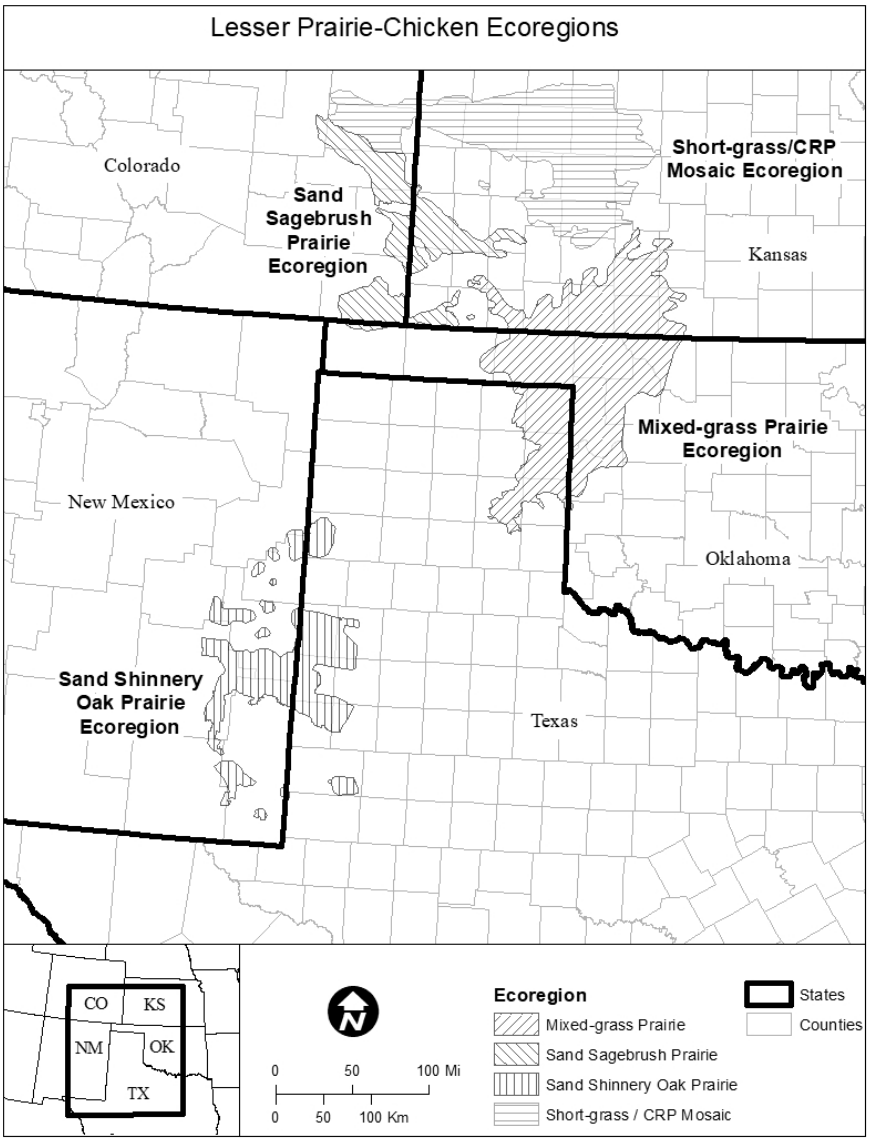


Figure 3. The four ecoregions that make up the range of the lesser prairie-chicken; the Sand Shinnery Oak Prairie (Shinnery Oak) Ecoregion, the Sand Sagebrush Prairie (Sand Sagebrush) Ecoregion, the Mixed-Grass Prairie (Mixed-Grass) Ecoregion, and the Short-grass/CRP Mosaic (Short-Grass/CRP) Ecoregion.

The Shinnery Oak Ecoregion occupies portions of eastern New Mexico and the South Plains of Texas (McDonald et al. 2012, p. 2). It has a variable vegetation community that contains a mix of shrubs such as sand shinnery oak (*Quercus havardii*) and sand sagebrush (*Artemisia filifolia*) as well as mixed and tall grasses and forbs (Grisham et al. 2016a, p. 317). The mean population estimate ranged between about 5,000 to 12,000 males through 1980, increased to 20,000 males in the mid-1980s and declined to ~1,000 males in 1997 (Hagen et al. 2017 pp. 6–9). The mean population

estimate peaked again to ~15,000 males in 2006 and then declined again to fewer than 3,000 males in the mid-2010s. While population estimates for the Shinnery Oak Ecoregion have varied over recent years, the most recent surveys estimate a 5-year average population size of 3,077 birds (90% confidence intervals (CI): 170, 8,237). Approximately 11 percent of all lesser prairie-chicken occur in this ecoregion (Service 2021, pp. 66–78). Lesser prairie-chicken from the Shinnery Oak Ecoregion are genetically distinct and geographically isolated from the other three ecoregions by 95 miles (mi) (153 kilometers (km)) (Figure 3; Oyler-McCance et al. 2016, p. 653).

With the exception of lesser prairie-chicken areas owned by the State Game Commission and federally owned BLM lands in New Mexico, the majority of the Shinnery Oak Ecoregion is privately owned (Grisham et al. 2016a, p. 315). Nearly all of the area in the Texas portion of the ecoregion is privately owned and managed for agricultural use and petroleum production (Haukos 2011, p. 110). The remaining patches of shinnery oak prairie have become isolated, relict communities because the surrounding grasslands have been converted to row crop agriculture or fragmented by oil and gas exploration and urban development (Peterson and Boyd 1998, p. 22). Additionally, honey mesquite (*Prosopis glandulosa*) encroachment within this ecoregion has played a significant role in decreasing available space for the lesser prairie-chicken. Technological advances in irrigated row crop agriculture have led to more recent conversion of shinnery oak prairie habitat to row crops in Eastern New Mexico and West Texas (Grisham et al. 2016a, p. 316).

The Sand Sagebrush Ecoregion occurs in Southeast Colorado, Southwest Kansas, and a small portion of Western Oklahoma (McDonald et al. 2012, p. 2). The vegetation community in this area primarily consists of sand sagebrush and the associated mixed and tall grass species that are usually found in the sandier soils adjacent to rivers, streams, and other drainages in the area. Lesser prairie-chicken from the Sand Sagebrush

Ecoregion form a distinct genetic cluster from other ecoregions but have likely contributed some individuals to the Short-Grass/CRP Ecoregion through dispersal (Oyler-McCance et al. 2016, p. 653).

Historically, the Sand Sagebrush Ecoregion supported the highest density of lesser prairie-chicken and was considered the core of the lesser prairie-chicken range (Haukos et al. 2016, p. 282). A single flock detected in Seward County, Kansas, was estimated to potentially contain more than 15,000 birds (Bent 1932, p. 281). The population size is estimated to have peaked at more than 85,000 males in the 1970s (Garton et al. 2016, p. 62) and has been in decline since the late 1970s. More recent survey efforts estimate a 5-year average population size of 1,215 birds (90% CI: 196, 4,547). Less than 5 percent of all lesser prairie-chicken occur in this ecoregion (Service 2021, pp. 66–78). Most of the decline has been attributed to habitat deterioration and conversion of sand sagebrush to intensive row crop agriculture due to an increase in center pivot irrigation (Jensen et al. 2000, p. 172). Environmental conditions in this ecoregion can be extreme, with stochastic events such as blizzards negatively impacting lesser prairie-chicken populations.

The Short-Grass/CRP Ecoregion falls within the mixed- and short-grass prairies of Central and Western Kansas (McDonald et al. 2012, p. 2). As the name implies, much of this ecoregion historically consisted of short-grass prairie interspersed with mixed-grass prairie as well as sand sagebrush prairie along some drainages (Dahlgren et al. 2016, p. 260). By the 1980s, large expanses of prairies had been converted from native grass for crop production in this ecoregion. After the introduction of the CRP in 1985, landowners began to have enhanced incentives to convert croplands to perennial grasslands to provide cover for the prevention of soil erosion. The State of Kansas required those enrolling in the CRP to plant native mixed- and tall-grass species, which is notable because the grasses in this area historically consisted largely of short-grass

species, which generally do not provide adequate habitat for the lesser prairie-chicken. For more information on the CRP, see the SSA report (Service 2021, pp. 52–54).

Prior to the late 1990s, lesser prairie-chickens in this ecoregion were thought to be largely absent (or occurred sporadically in low densities) (Hagen and Giesen 2005, unpaginated; Rodgers 1999, p. 19). We do not know what proportion of the eastern Short-Grass/CRP Ecoregion in Kansas was historically occupied by lesser prairie-chicken (Hagen 2003, pp. 3–4), and surveys in this ecoregion only began in earnest in 1999 (Dahlgren et al. 2016, p. 262). The CRP is an idle lands program, which requires establishment of grass cover and precludes tillage or agricultural commodity production for the duration of the contract, and has contractual limits to the type, frequency, and timing of management activities, such as burning, haying, or grazing of the established grasses. As a result of these factors, CRP often provides the vegetative structure preferentially used by lesser prairie-chickens for nesting. In the State of Kansas, the availability of CRP lands, especially CRP lands with interseeded or original seed mixture of forbs, resulted in increased habitat availability for the lesser prairie-chicken and, thus, an expansion of the known lesser prairie-chicken range and an increase in the abundance of the lesser prairie-chicken (Rodgers 1999, pp. 18–19; Fields 2004, pp. 11, 105; Fields et al. 2006, pp. 931, 937; Sullins et al. 2018, p. 1617).

The Short-Grass/CRP Ecoregion is now estimated to contain the majority of lesser prairie-chickens compared to the other ecoregions, with recent survey efforts estimating a 5-year average population size of 16,957 birds (90% CI: 13,605, 35,350), representing approximately 62 percent of the rangewide population (Service 2021, pp. 66–78). Recent genetic studies indicate that lesser prairie-chickens have moved northward largely from the Mixed-Grass Ecoregion and, to a lesser extent, the Sand Sagebrush Ecoregion into the Short-Grass/CRP Ecoregion (Oyler-McCance et al. 2016, p. 653).

The northern section of this ecoregion is the only portion of the lesser prairie-chicken's range where co-occurrence with greater prairie-chicken occurs. Hybridization rates of up to 5 percent have been reported (Pitman 2013, p. 5), and that rate seemed to be stable across multiple years, though sampling is limited where the species co-occur (Pitman 2013, p. 12). Limited additional work has been completed to further assess the rate of hybridization. There are concerns about the implications of genetic introgression (dilution) of lesser prairie-chicken genes, particularly given that potential effects are poorly understood (Dahlgren et al. 2016, p. 276). Unresolved issues include whether hybridization reduces fitness, alters behavior or morphological traits in either a positive or negative way and the historical occurrence and rate of hybridization.

The Mixed-Grass Ecoregion for the lesser prairie-chicken lies in the northeastern panhandle of Texas, the panhandle of northwestern Oklahoma, and south-central Kansas (McDonald et al. 2012, p. 2). The Mixed-Grass Ecoregion is separated from the Short-Grass/CRP Ecoregion in Kansas by the Arkansas River. The vegetation community in this ecoregion consists largely of a mix of perennial grasses and shrubs such as sand sagebrush, sand plum (*Prunus angustifolia*), yucca (*Yucca* spp.), and sand shinnery oak (Wolfe et al. 2016, p. 300). Based upon population reconstruction data, the mean population estimate was around 30,000 males in the 1970s and 1980s followed by a decline in the 1990s (Hagen et al. 2016, pp. 6–7). The mean population estimate peaked again in the early 2000s at around 25,000 males, before declining to and remaining at its lowest levels, <10,000 males since 2012 (Hagen et al. 2016, pp. 6–7). Although historical population estimates in the ecoregion reported some of the highest densities of lesser prairie-chicken in the range (Wolfe et al. 2016, p. 299), recent aerial survey efforts estimate a 5-year average population size of 6,135 birds (including males and females; 90% CI: 1,719, 11,847). The recent survey work estimates about 22 percent of lesser prairie-chicken occur in this ecoregion (Service 2021, pp. 66–78). Lesser prairie-chicken

from the Mixed-Grass Ecoregion are similar in genetic variation with the Short-Grass/CRP Ecoregion, with individuals likely dispersing from the Mixed-Grass Ecoregion to the Short-Grass/CRP Ecoregion (Oyler-McCance et al. 2016, p. 653).

Distinct Population Segment Evaluation

Under the Act, the term species includes "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." 16 U.S.C. 1532(16). To guide the implementation of the distinct population segment (DPS) provisions of the Act, we and the National Marine Fisheries Service (National Oceanic and Atmospheric Administration—Fisheries), published the Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (DPS Policy) in the *Federal Register* on February 7, 1996 (61 FR 4722). Under our DPS Policy, we use two elements to assess whether a population segment under consideration for listing may be recognized as a DPS: (1) The population segment's discreteness from the remainder of the species to which it belongs, and (2) the significance of the population segment to the species to which it belongs. If we determine that a population segment being considered for listing is a DPS, then the population segment's conservation status is evaluated based on the five listing factors established by the Act to determine if listing it as either endangered or threatened is warranted.

As described in **Previous Federal Actions**, we were petitioned to list the lesser prairie-chicken either rangewide or in three distinct population segments. The petition suggested three DPS configurations: (1) Shinnery Oak Ecoregion, (2) the Sand Sagebrush Ecoregion, and (3) a segment including the Mixed-Grass Ecoregion and the Short-Grass/CRP Ecoregion. The petition also combined the Sand Sagebrush Ecoregion, the Mixed-Grass Ecoregion, and the Short-Grass/CRP Ecoregion due to evidence they are linked genetically and geographically (Molver 2016, p. 18). Genetic studies indicate that

lesser prairie-chicken from the Mixed-Grass Ecoregion are similar in genetic variation with the Short-Grass/CRP Ecoregion, with individuals likely dispersing from the Mixed-Grass Ecoregion to the Short-Grass/CRP Ecoregion (Oyler-McCance et al. 2016, p. 653). Other genetic data indicate that lesser prairie-chicken from the Sand Sagebrush Ecoregion and lesser prairie-chicken from the Mixed-Grass and Short-Grass/CRP Ecoregion also share genetic traits. Genetic studies of neutral markers indicate that, although lesser prairie-chicken from the Sand Sagebrush Ecoregion form a distinct genetic cluster from other ecoregions, they have also likely contributed some individuals to the Short-Grass/CRP Ecoregion through dispersal (Oyler-McCance et al. 2016, p. 653). Additionally, these three ecoregions are not geographically isolated from one another (Figure 3). As a result of the shared genetic characteristics and the geographic connections, we have concluded the Sand Sagebrush Ecoregion, the Mixed-Grass Ecoregion, and the Short-Grass/CRP Ecoregion are appropriately considered as one potential DPS configuration.

Under the Act, we have the authority to consider for listing any species, subspecies, or, for vertebrates, any distinct population segment (DPS) of these taxa if there is sufficient information to indicate that such action may be warranted. We considered whether two segments meet the DPS criteria under the Act: The southernmost ecoregion (Shinnery Oak) and a segment containing the three northernmost ecoregions (Mixed-Grass, Short-Grass/CRP, and Sand Sagebrush).

Discreteness

Under our DPS Policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation; or (2) it is

delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

We conclude the two segments satisfy the "markedly separate" conditions. The two groups of ecoregions are not separated from each other by international governmental boundaries. The southernmost ecoregion (Shinnery Oak) is separated from the three northern ecoregions by approximately 95 mi (153 km), much of which is developed or otherwise unsuitable habitat. There has been no recorded movement of lesser prairie-chickens between the Shinnery Oak Ecoregion and the three northern ecoregions over the past several decades. Because there is no connection between the two parts of the range, there is subsequently no gene flow between them (Oyler-McCance et al. 2016, entire).

Therefore, we have determined that both the southern ecoregion and the northern three ecoregions of the lesser prairie-chicken range both individually meet the condition for discreteness under our DPS Policy.

Significance

Under our DPS Policy, once we have determined that a population segment is discrete, we consider its biological and ecological significance to the larger taxon to which it belongs. This consideration may include, but is not limited to: (1) Evidence of the persistence of the discrete population segment in an ecological setting that is unusual or unique for the taxon, (2) evidence that loss of the population segment would result in a significant gap in the range of the taxon, (3) evidence that the population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historical range, or (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

For the lesser prairie-chicken, we first considered evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. The most recent rangewide genetic study examined neutral markers in the four ecoregions where the lesser prairie-chicken occurs. It concluded that there is significant genetic variation across the lesser prairie-chicken range. The study also concluded that although there is genetic exchange between the three northern ecoregions (particularly movement of birds northward from the Mixed-Grass Ecoregion to the Short-Grass/CRP Ecoregion, and, to a lesser extent, from the Sand Sagebrush Ecoregion into the Short-Grass/CRP Ecoregion), lesser prairie-chicken from the Shinnery Oak Ecoregion in the southwestern part of the range are a group that is genetically distinct from the remainder of the range (Oyler-McCance et al. 2016, p. 653). The Shinnery Oak Ecoregion is more distinct from all three ecoregions in the Northern DPS than those ecoregions are from each other (Oyler-McCance et al. 2016, Table 4). The Shinnery Oak Ecoregion was likely historically connected to the remainder of the range, but the two parts have been separated since approximately the time of European settlement. Therefore, the two segments of the range are genetically distinct from each other.

We next considered evidence that loss of the population segment would result in a significant gap in the range of the taxon. As discussed above, the southwestern and northeastern parts of the range are separated by approximately 95 mi (153 km). The loss of the Shinnery Oak Ecoregion would result in the loss of the entire southwestern part of the species' range and decrease species redundancy and ecological and genetic representation, thus decreasing its ability to withstand demographic and environmental stochasticity. The loss of the other three ecoregions would result in the loss of 75 percent of the species' range, as well as loss of the part of the range (the Short-Grass/CRP Ecoregion) which has recently experienced a northward expansion of occupied habitat. This would create a large gap in the northeastern portion of the species range, also

reducing the species' ability to withstand demographic and environmental stochasticity. Therefore, the loss of either part of the range would result in a significant gap in the range of the lesser prairie-chicken. These genetic differences and the evidence that a significant gap in the range of the taxon would result from the loss of either discrete population segment both individually satisfy the significance criterion of the DPS Policy. Therefore, under the Service's DPS Policy, we find that both the southern and northern segments of the lesser prairie-chicken are significant to the taxon as a whole.

Distinct Population Segment Conclusion

Our DPS Policy directs us to evaluate the significance of a discrete population in the context of its biological and ecological significance to the remainder of the species to which it belongs. Based on an analysis of the best available scientific and commercial data, we conclude that the northern and southern parts of the lesser prairie-chicken range are discrete due to geographic (physical) isolation from the remainder of the taxon. Furthermore, we conclude that both parts of the lesser prairie-chicken range are significant, because loss of either part would result in a significant gap in the range of the taxon, and because the two parts of the range are markedly separate based on neutral genetic markers. Therefore, we conclude that both the northern and southern parts of the lesser prairie-chicken range are both discrete and significant under our DPS Policy and are, therefore, uniquely listable entities under the Act.

Based on our DPS Policy (61 FR 4722; February 7, 1996), if a population segment of a vertebrate species is both discrete and significant relative to the taxon as a whole (*i.e.,* it is a distinct population segment), its evaluation for endangered or threatened status will be based on the Act's definition of those terms and a review of the factors enumerated in section 4(a) of the Act. Having found that both parts of the lesser prairie-chicken range meet the definition of a distinct population segment, we evaluate the status of both the Southern DPS and the Northern DPS of the lesser prairie-chicken to

determine whether either meets the definition of an endangered or threatened species under the Act. The line demarcating the break between the Northern and Southern DPS lies approximately half-way between the two DPSs in the unoccupied area between them (Figure 4).

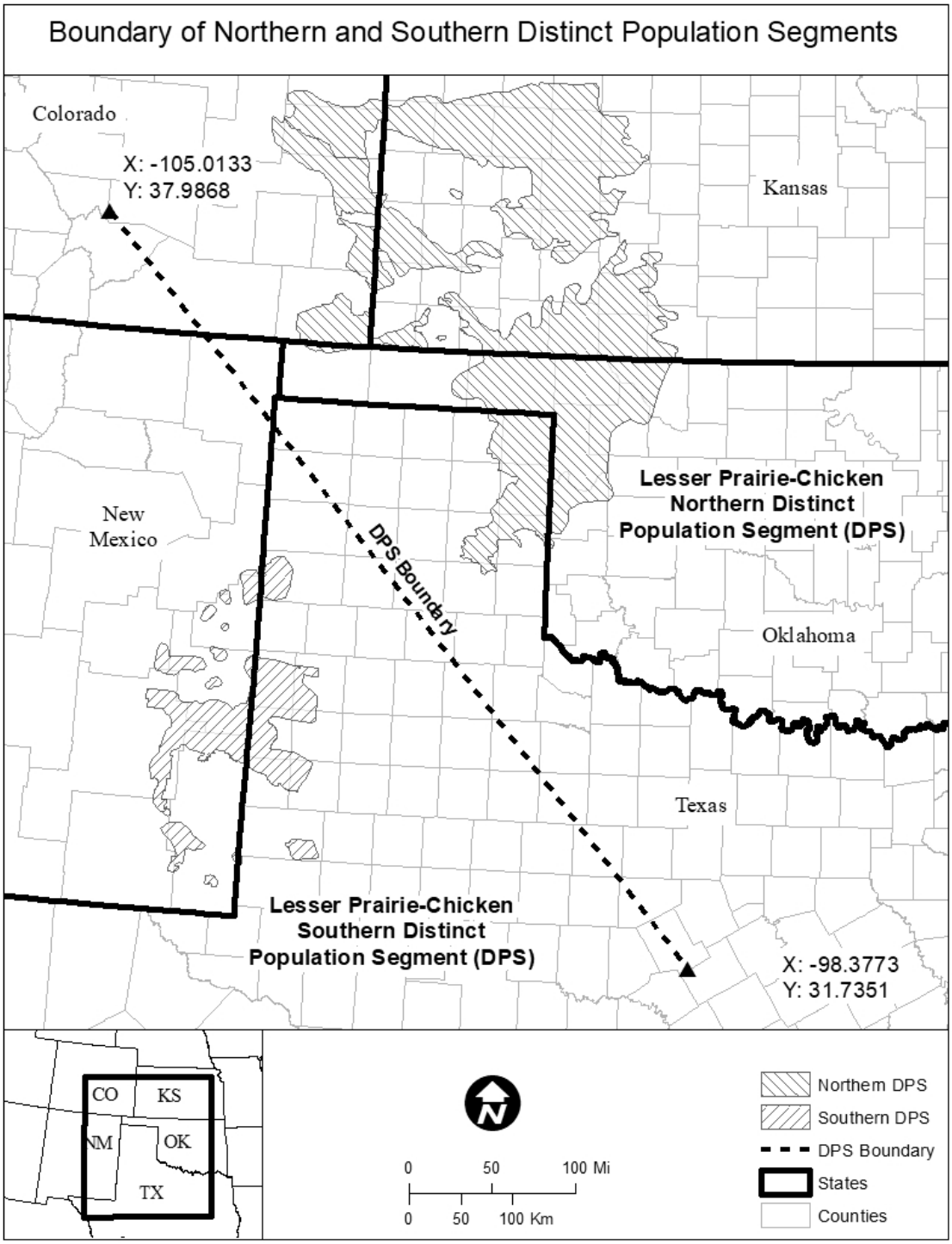


Figure 4. The Northern and Southern DPSs of the lesser prairie-chicken. Areas northeast of the dividing line constitute the Northern DPS, while areas southwest of the line constitute the Southern DPS.

Regulatory and Analytical Framework

Regulatory Framework

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species is an endangered species or a threatened species. The Act defines an endangered species as a species that is "in danger of extinction throughout all or a significant portion of its range," and a threatened species as a species that is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether any species is an "endangered species" or a "threatened species" because of any of the following factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species' continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any negative effects or may have positive effects.

We use the term "threat" to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term "threat" includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term "threat" may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an "endangered species" or a "threatened species." In determining whether a species meets either definition, we must evaluate all identified threats by considering the expected response by the species and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an "endangered species" or a "threatened species" only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

The Act does not define the term "foreseeable future," which appears in the statutory definition of "threatened species." Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis. The term "foreseeable future" extends only so far into the future as the Services can reasonably determine that both the future threats and the species' responses to those threats are likely. In other words, the foreseeable future is the period of time in which we can make reliable predictions. "Reliable" does not mean "certain"; it means sufficient to provide a reasonable degree of confidence in the prediction. Thus, a prediction is reliable if it is reasonable to depend on it when making decisions.

It is not always possible or necessary to define foreseeable future as a particular number of years. Analysis of the foreseeable future uses the best scientific and commercial data available and should consider the timeframes applicable to the relevant threats and to the species' likely responses to those threats in view of its life-history

characteristics. Data that are typically relevant to assessing the species' biological response include species-specific factors such as lifespan, reproductive rates or productivity, certain behaviors, and other demographic factors.

Analytical Framework

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent a decision by the Service on whether the species should be proposed for listing as an endangered or threatened species under the Act. It does, however, provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies. The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found on *http://www.regulations.gov* at Docket FWS–R2–ES–2021–0015.

To assess lesser prairie-chicken viability, we used the three conservation biology principles of resiliency, redundancy, and representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency supports the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy supports the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation supports the ability of the species to adapt over time to long-term changes in the environment (for example, climate changes). In general, the more resilient and redundant a species is and the more representation it has, the more likely it is to sustain populations over time, even under changing environmental conditions. Using these principles, we identified the species' ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species' viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated the individual species' life-history needs. The next stage involved an assessment of the historical and current condition of the species' demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species' responses to positive and negative environmental and anthropogenic influences that are likely to occur in the future. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

The SSA report does not assess the distinct population segments proposed for the species because the SSA focuses on the biological factors, rather than those, such as DPS, that are created by the regulatory framework of the Act. Both the geospatial and threats analysis in the SSA report are summarized by ecoregion. In this proposed rule, we present the analyses per ecoregion from the SSA report but also summarize per DPS as applicable.

Summary of Biological Status and Threats

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species' current and future condition, in order to assess the species' overall viability and the risks to that viability.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have not only analyzed individual effects on the species, but we have also analyzed their potential cumulative effects. We incorporate the cumulative effects into our SSA analysis when we characterize the current and future condition of the species. To assess the current and future condition of the species, we undertake an iterative analysis that encompasses and incorporates the threats individually and then accumulates and evaluates the effects of all the factors that

may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to the entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

Representation

To evaluate representation as a component of lesser prairie-chicken viability, we considered the need for multiple healthy lesser prairie-chicken populations within each of the four ecoregions to conserve the genetic and ecological diversity of the lesser prairie-chicken. Each of the four ecoregions varies in terms of vegetative communities and environmental conditions, resulting in differences in abundance and distribution and management strategies (Boal and Haukos 2016, p. 5). Despite reduced range and population size, most lesser prairie-chicken populations appear to have maintained comparatively high levels of neutral genetic variation (DeYoung and Williford 2016, p. 86). As discussed in *Significance* above, recent genetic studies also show significant genetic variation across the lesser prairie-chicken range based on neutral markers (Service 2021, Figure 2.4), which supports management separation of these four ecoregions and highlights important genetic differences between them (Oyler-McCance et al. 2016, p. 653). While it is unknown how this genetic variation relates to differences in adaptive capacity between the ecoregions, maintaining healthy lesser prairie-chicken populations across this range of diversity increases the likelihood of conserving inherent ecological and genetic variation within the species to enhance its ability for adaptation to future changes in environmental conditions.

Resiliency

In the case of the lesser prairie-chicken, we considered the primary indicators of resiliency to be habitat availability, population abundance, growth rates, and quasi-extinction risk. Lesser prairie-chicken populations within ecoregions must have sufficient

habitat and population growth potential to recover from natural disturbance events such as extensive wildfires, extreme hot or cold events, extreme precipitation events, or extended local periods of below-average rainfall. These events can be particularly devastating to populations when they occur during the late spring or summer when nesting and brood rearing are occurring and individuals are more susceptible to mortality.

The lesser prairie-chicken is considered a "boom–bust" species based on its high reproductive potential with a high degree of annual variation in rates of successful reproduction and recruitment. These variations are largely driven by the influence of seasonal precipitation patterns (Grisham et al. 2013, pp. 6–7), which impact the population through effects on the quality of habitat. Periods of below-average precipitation and higher spring/summer temperatures result in less appropriate grassland vegetation cover and less food available, resulting in decreased reproductive output (bust periods). Periods with above-normal precipitation and cooler spring/summer temperatures will support favorable lesser prairie-chicken habitat conditions and result in high reproductive success (boom periods). In years with particularly poor weather conditions, individual female lesser prairie-chicken may forgo nesting for the year. This population characteristic highlights the need for habitat conditions to support large population growth events during favorable climatic conditions so they can withstand the declines during poor climatic conditions without a high risk of extirpation.

Historically, the lesser prairie-chicken had large expanses of grassland habitat to maintain populations. Early European settlement and development of the Southern Great Plains for agriculture initially, and for energy extraction later, substantially reduced the amount and connectivity of the grasslands of this region. Additionally, if historically some parts of the range were drastically impacted or eliminated due to a stochastic event, that area could be reestablished from other populations. Today, those characteristics of the grasslands have been degraded, resulting in the loss and fragmentation of grasslands

in the Southern Great Plains. Under present conditions, the potential lesser prairie-chicken habitat is limited to small, fragmented grassland patches (relative to historical conditions) (Service 2021, pp. 64–78). The larger and more intact the remaining grassland patches are, with appropriate vegetation structure, the larger, healthier, and more resilient the lesser prairie-chicken populations will be. Exactly how large habitat patches should be to support healthy populations depends on the quality and intactness of the patches. Recommended total space needed for persistence of lesser prairie-chicken populations ranges from a minimum of about 12,000 ac (4,900 ha) (Davis 2005, p. 3) up to more than 50,000 ac (20,000 ha) to support single leks, depending on the quality and intactness of the area (Applegate and Riley 1998, p. 14; Haufler et al. 2012, pp. 7–8; Haukos and Zavaleta 2016, p. 107).

A single lesser prairie-chicken lek is not considered a population that can persist on its own. Instead, complexes of multiple leks that interact with each other are required for a lesser prairie-chicken population to be persistent over time. These metapopulation dynamics, in which individuals interact on the landscape to form larger populations, are dependent upon the specific biotic and abiotic landscape characteristics of the site and how those characteristics influence space use, movement, patch size, and fragmentation (DeYoung and Williford 2016, pp. 89–91). Maintaining multiple, highly resilient populations (complexes of leks) within the four ecoregions that have the ability to interact with each other will increase the probability of persistence in the face of environmental fluctuations and stochastic events. Because of this concept of metapopulations and their influence on long-term persistence, when evaluating lesser prairie-chicken populations, site-specific information can be informative. However, many of the factors affecting lesser prairie-chicken populations should be analyzed at larger spatial scales (Fuhlendorf et al. 2002, entire).

Redundancy

Redundancy describes the ability of a species to withstand catastrophic events. Catastrophes are stochastic events that are expected to lead to population collapse regardless of population health and for which adaptation is unlikely. Redundancy spreads the risk and can be measured through the duplication and distribution of resilient populations that are connected across the range of the species. The larger the number of highly resilient populations the lesser prairie-chicken has, distributed over a large area within each ecoregion, the better the species can withstand catastrophic events. Catastrophic events for lesser prairie-chicken might include extreme drought; widespread, extended droughts; or a disease outbreak.

Measuring redundancy for lesser prairie-chicken is a difficult task due to the physiological and biological characteristics of the species, which make it difficult to survey and limit the usefulness of survey results. To estimate redundancy for the lesser prairie-chicken, we estimated the geographic distribution of predicted available habitat within each of the four ecoregions and the juxtaposition of that habitat to other habitat and non-habitat. As the amount of large grassland patches decreases and grassland patches become more isolated to reduce or preclude lesser prairie-chicken movement between them, the overall redundancy of the species is reduced. As redundancy decreases within any representative ecoregion or DPS, the likelihood of extirpation within that ecoregion increases. As large grassland patches, the connectivity of those patches, and the number of lesser prairie-chicken increase, so does the redundancy within an ecoregion or a DPS.

Current Condition

In the SSA report, we assessed the current condition of the lesser prairie-chicken through an analysis of existing habitat; a review of factors that have impacted the species in the past, including a geospatial analysis to estimate areas of land cover impacts on the current landscape condition; a summary of the current potential usable area based upon

our geospatial analysis; and a summary of past and current population estimates. We also evaluated and summarized the benefit of the extensive conservation efforts that are ongoing throughout the lesser prairie-chicken range to conserve the species and its habitat.

Geospatial Analysis Summary

The primary concern for the lesser prairie-chicken is habitat loss and fragmentation. We conducted a geographic information system (GIS) analysis to analyze the extent of usable land cover changes and fragmentation within the range of the lesser prairie-chicken, characterizing landscape conditions spatially to analyze the ability of those landscapes to support the biological needs of the lesser prairie-chicken. Impacts included in this analysis were the direct and indirect effects of areas that were converted to cropland; encroached by woody vegetation such as mesquite and eastern red cedar (*Juniperus virginiana*); and developed for roads, petroleum production, wind energy, and transmission lines. We acknowledge that there are other impacts, such as power lines or incompatible grazing on the landscape, that can affect lesser prairie-chicken habitat. For those impacts, either no geospatial data were available, or the available data would have added so much complexity to our geospatial model that the results would have been uninterpretable or not explanatory for our purpose.

There are several important limitations to our geospatial analysis. First, it is a landscape-level analysis, so the results only represent broad trends at the ecoregional and rangewide scales. Secondly, this analysis does not incorporate different levels of habitat quality, as the data do not exist at the spatial scale or resolution needed. Our analysis only considers areas as either potentially usable or not usable by lesser prairie-chicken based upon land cover classifications. We recognize that some habitat, if managed as high-quality grassland, may have the ability to support higher densities of lesser prairie-chicken than other habitat that exists at lower qualities. Additionally, we also recognize

that some areas of land cover that we identified as suitable could be of such poor quality that it is of limited value to the lesser prairie-chicken. We recognize there are many important limitations to this landscape analysis, including variation and inherent error in the underlying data and unavailable data. We interpreted the results of this analysis with those limitations in mind.

In this proposed rule, we discuss effects that relate to the total potential usable unimpacted acreage for lesser prairie-chicken, as defined by our geospatial analysis (hereafter, analysis area). A complete description of the purpose, methodology, constraints, and additional details for this analysis is provided in the SSA report for the lesser prairie-chicken (Service 2021, Appendix B, Parts 1, 2, and 3).

Threats Influencing Current Condition

Following are summary evaluations of the threats analyzed in the SSA report for the lesser prairie-chicken: effects associated with habitat degradation, loss, and fragmentation, including conversion of grassland to cropland (Factor A), petroleum production (Factor A), wind energy development and transmission (Factor A), woody vegetation encroachment (Factor A), and roads and electrical distribution lines (Factor A); other factors, such as livestock grazing (Factor A), shrub control and eradication (Factor A), collision mortality from fences (Factor E), predation (Factor C), influence of anthropogenic noise (Factor E), fire (Factor A); and extreme weather events (Factor E). We also evaluate existing regulatory mechanisms (Factor D) and ongoing conservation measures.

In the SSA report, we also considered three additional threats: hunting and other recreational, educational, and scientific use (Factor B); parasites and diseases (Factor C); and insecticides (Factor E). We concluded that, as indicated by the best available scientific and commercial information, these threats are currently having little to no impact on lesser prairie-chickens and their habitat, and thus their overall effect now and

into the future is expected to be minimal. Therefore, we will not present summary analyses of those threats in this document but will consider them in our overall conclusions of impacts to the species. For full descriptions of all threats and how they impact the species, please see the SSA report (Service 2021, pp. 24–49).

Habitat Degradation, Loss, and Fragmentation

The grasslands of the Great Plains are among the most threatened ecosystems in North America (Samson et al. 2004, p. 6) and have been impacted more than any other major ecosystem on the continent (Samson and Knopf 1994, p. 418). Temperate grasslands are also one of the least conserved ecosystems (Hoekstra et al. 2005, p. 25). Grassland loss in the Great Plains is estimated at approximately 70 percent (Samson et al. 2004, p. 7), with nearly 93,000 square km (23 million ac; 9.3 million ha) of grasslands in the United States lost between 1982 and 1997 alone (Samson et al. 2004, p. 9). The vast majority of the lesser prairie-chicken range (>95 percent) occurs on private lands that have been in some form of agricultural production since at least the early 1900s. As a result, available habitat for grassland species, such as the lesser prairie-chicken, has been much reduced and fragmented compared to historical conditions across its range.

Habitat impacts occur in three general categories that often work synergistically at the landscape scale: degradation, loss, and fragmentation. Habitat degradation results in changes to a species' habitat that reduces its suitability to the species, but without making the habitat entirely unsuitable. Degradation may result in lower carrying capacity, lower reproductive potential, higher predation rates, or other effects. Habitat loss may result from the same anthropogenic sources that cause degradation, but the habitat has been altered to the point where it has no suitability for the species at all. Habitat fragmentation occurs when habitat loss is patchy and leaves a matrix of grassland habitat behind. While habitat degradation continues to be a concern, we focus our analysis on habitat loss and

fragmentation from the cumulative effects of multiple sources of activities as the long-term drivers of the species' viability.

Initially, reduction in the total area of available habitat may be more significant than fragmentation and can exert a much greater effect on populations (Fahrig 1997, pp. 607, 609). However, as habitat loss continues, the effects of fragmentation often compound effects of habitat loss and produce even greater population declines than habitat loss alone (Bender et al. 1998, pp. 517–518, 525). Spatial habitat fragmentation occurs when some form of disturbance, usually habitat degradation or loss, results in the separation or splitting apart of larger, previously contiguous, functional components of habitat into smaller, often less valuable, noncontiguous patches (Wilcove et al. 1986, p. 237; Johnson and Igl 2001, p. 25; Franklin et al. 2002, entire). Habitat loss and fragmentation influence habitat availability and quality in three primary ways: (1) total area of available habitat constrains the maximum population size for an area; (2) the size of habitat patches within a larger habitat area, including edge effects (changes in population or community structures that occur at the boundary of two habitats), influences habitat quality and size of local populations; and (3) patch isolation influences the amount of species movement between patches, which constrains demographic and genetic exchange and ability to recolonize local areas where the species might be extirpated (Johnson and Igl 2001, p. 25; Stephens et al. 2003, p. 101).

Habitat loss, fragmentation, and degradation correlate with the ecological concept of carrying capacity. Within any given block or patch of lesser prairie-chicken habitat, carrying capacity is the maximum number of birds that can be supported indefinitely by the resources available within that area, that is, sufficient food, shelter, and lekking, nesting, brood-rearing, and wintering areas. As habitat loss increases and the size of an area decreases, the maximum number of birds that can inhabit that particular habitat patch also decreases. Consequently, a reduction in the total area of available habitat can

negatively influence biologically important characteristics such as the amount of space available for establishing territories and nest sites (Fahrig 1997, p. 603). Over time, the continued conversion and loss of habitat will reduce the capacity of the landscape to support historical population levels, causing a decline in population sizes.

Habitat loss not only contributes to overall declines in usable area for a species but also causes a reduction in the size of individual habitat patches and influences the proximity and connectivity of these patches to other patches of similar habitat (Stephens et al. 2003, p. 101; Fletcher 2005, p. 342), reducing rates of movement between habitat patches until, eventually, complete isolation results. Habitat quality for many species is, in part, a function of patch size and declines as the size of the patch decreases (Franklin et al. 2002, p. 23). Both the size and shape of the habitat patch have been shown to influence population persistence in many species (Fahrig and Merriam 1994, p. 53). The size of the fragment can influence reproductive success, survival, and movements. As the distances between habitat fragments increase, the rate of dispersal between the habitat patches may decrease and ultimately cease, reducing the likelihood of population persistence and potentially leading to both localized and regional extinctions (Harrison and Bruna 1999, p. 226; With et al. 2008, p. 3153). In highly fragmented landscapes, once a species becomes extirpated from an area, the probability of recolonization is greatly reduced (Fahrig and Merriam 1994, p. 52).

For the lesser prairie-chicken, habitat loss can occur due to either direct or indirect habitat impacts. Direct habitat loss is the result of the removal or alteration of grasslands, making that space no longer available for use by the lesser prairie-chicken. Indirect habitat loss and degradation is when the vegetation still exists, but the areas adjacent to a disturbance (the disturbance can be natural or manmade) are no longer used by lesser prairie-chicken, are used at reduced rates, or the disturbance negatively alters demographic rates or behavior in the affected area. In many cases, as discussed in detail

below for specific disturbances, the indirect habitat loss can greatly exceed the direct habitat loss.

Primarily due to their site fidelity and the need for large, ecologically diverse landscapes, lesser prairie-chickens appear to be relatively intolerant to habitat alteration, particularly for activities that fragment habitat into smaller patches. The birds require habitat patches with large expanses of vegetative structure in different successional stages to complete different phases in their life cycle, and the loss or partial loss of even one of these structural components can significantly reduce the overall value of that habitat to lesser prairie-chickens (Elmore et al. 2013, p. 4). In addition to the impacts on the individual patches, as habitat loss and fragmentation increases on the landscape, the juxtaposition of habitat patches to each other and to non-habitat areas will change. This changing pattern on the landscape can be complex and difficult to predict, but the results, in many cases, are increased isolation of individual patches (either due to physical separation or barriers preventing or limiting movement between patches) and direct impacts to metapopulation structure, which could be important for population persistence (DeYoung and Williford 2016, pp. 88–91).

The following sections provide a discussion and quantification of the influence of habitat loss and fragmentation on the grasslands of the Great Plains within the lesser prairie-chicken analysis area and more specifically allow us to characterize the current condition of lesser prairie-chicken habitat.

Conversion of Grassland to Cropland

Historical conversion of grassland to cultivated agricultural lands in the late 19th century and throughout the 20th century has been regularly cited as an important cause in the rangewide decline in abundance and distribution of lesser prairie-chicken populations (Copelin 1963, p. 8; Jackson and DeArment 1963, p. 733; Crawford and Bolen 1976a, p. 102; Crawford 1980, p. 2; Taylor and Guthery 1980b, p. 2; Braun et al. 1994, pp. 429,

432–433; Mote et al. 1999, p. 3). Because cultivated grain crops may have provided increased or more dependable winter food supplies for lesser prairie-chickens (Braun et al. 1994, p. 429), the initial conversion of smaller patches of grassland to cultivation may have been temporarily beneficial to the short-term needs of the species as primitive and inefficient agricultural practices made grain available as a food source (Rodgers 2016, p. 18). However, as conversion increased, it became clear that landscapes having greater than 20 to 37 percent cultivated grains may not support stable lesser prairie-chicken populations (Crawford and Bolen 1976a, p. 102). More recently, abundances of lesser prairie-chicken increased with increasing cropland until a threshold of 10 percent was reached; after that, abundance of lesser prairie-chicken declined with increasing cropland cover (Ross et al. 2016b, entire). While lesser prairie-chicken may forage in agricultural croplands, croplands do not provide for the habitat requirements of the species life cycle (cover for nesting and thermoregulation); thus, lesser prairie-chicken avoid landscapes dominated by cultivated agriculture, particularly where small grains are not the dominant crop (Crawford and Bolen 1976a, p. 102).

As part of the geospatial analysis completed for the SSA, we estimated the amount of cropland that currently exists in the four ecoregions of the lesser prairie-chicken. These percentages do not equate to the actual proportion of habitat loss in the analysis area because not all of the analysis area was necessarily suitable lesser prairie-chicken habitat; they are only the estimated portion of the total analysis area converted from the native vegetation community to cropland. About 37 percent of the total area in the Short-Grass/CRP Ecoregion; 32 percent of the total area in the Sand Sagebrush Ecoregion; 13 percent of the total area in the Mixed-Grass Ecoregion; and 14 percent of the total area in the Shinnery Oak Ecoregion of grassland have been converted to cropland in the analysis area of the lesser prairie-chicken. Rangewide, we estimate about 4,963,000 ac (2,009,000 ha) of grassland have been converted to cropland, representing

about 23 percent of the total analysis area. We note that these calculations do not account for all conversion that has occurred within the historical range of the lesser prairie-chicken but are limited to the amount of cropland within our analysis area. For further information, including total acreages impacted, see the SSA report for the lesser prairie-chicken (Service 2021 Appendix E and Figure E.1).

The effects of grassland converted to cropland within the historical range of the lesser prairie-chicken have significantly impacted the amount of habitat available and how fragmented the remaining habitat is for the lesser prairie-chicken, leading to overall decreases in resiliency and redundancy throughout the range of the lesser prairie-chicken. The impact of cropland has shaped the historical and current condition of the grasslands and shrublands upon which the lesser prairie-chicken depends.

Petroleum and Natural Gas Production

Petroleum and natural gas production has occurred over much of the estimated historical and current range of the lesser prairie-chicken. As demand for energy has continued to increase nationwide, so has oil and gas development in the Great Plains. In Texas, for example, active oil and gas wells in the lesser prairie-chicken occupied range have increased by more than 80 percent over the previous decade (Timmer et al. 2014, p. 143). The impacts from oil and gas development extend beyond the immediate well sites; they involve activities such as surface exploration, exploratory drilling, field development, and facility construction, as well as access roads, well pads, and operation and maintenance. Associated facilities can include compressor stations, pumping stations, and electrical generators.

Petroleum and natural gas production result in both direct and indirect habitat effects to the lesser prairie-chicken (Hunt and Best 2004, p. 92). Well pad construction, seismic surveys, access road development, power line construction, pipeline corridors, and other activities can all result in direct habitat loss by removal of vegetation used by

lesser prairie-chickens. As documented in other grouse species, indirect habitat loss also occurs from avoidance of vertical structures, noise, and human presence (Weller et al. 2002, entire), which all can influence lesser prairie-chicken behavior in the general vicinity of oil and gas development areas. These activities also disrupt lesser prairie-chicken reproductive behavior (Hunt and Best 2004, p. 41).

Anthropogenic features, such as oil and gas wells, affect the behavior of lesser prairie-chickens and alter the way in which they use the landscape (Hagen et al. 2011, pp. 69–73; Pitman et al. 2005, entire; Hagen 2010, entire; Hunt and Best 2004, pp. 99–104; Plumb et al. 2019, pp. 224–227; Sullins et al. 2019, pp. 5–8; Peterson et al. 2020, entire). Please see the SSA report for a detailed summary of the best available scientific information regarding avoidance distances and effects of oil and gas development on lesser prairie-chicken habitat use (Service 2021, pp. 27–28).

As part of the geospatial analysis discussed in the SSA report, we calculated the amount of usable land cover for the lesser prairie-chicken that has been impacted (both direct and indirect impacts) by oil and natural gas wells in the current analysis area of the lesser prairie-chicken, though this analysis did not include all associated infrastructure as those data were not available. We used an impact radius of 984 ft (300 m) for indirect effects of oil and gas wells. These calculations were limited to the current analysis area and do not include historical impacts of habitat loss that occurred outside of the current analysis area. Thus, the calculation likely underestimates the rangewide effects of historical oil and gas development on the lesser prairie-chicken. About 4 percent of the total area in the Short-Grass/CRP Ecoregion; 5 percent of the total area in the Sand Sagebrush Ecoregion; about 10 percent of the total area in the Mixed-Grass Ecoregion; and 4 percent of the total area in the Shinnery Oak Ecoregion of space that was identified as potential usable or potential restorable areas have been impacted due to oil and gas development in the current analysis area of the lesser prairie-chicken. Rangewide, we

estimate about 1,433,000 ac (580,000 ha) of grassland have been lost due to oil and gas development representing about 7 percent of the total analysis area. Maps of these areas in each ecoregion are provided in the SSA report (Service 2021, Appendix E, Figure E.2).

Oil and gas development directly removes habitat that supports lesser prairie-chicken, and the effects of the development extend past the immediate site of the wells and their associated infrastructure, further impacting habitat and altering behavior of lesser prairie-chicken throughout both the Northern and the Southern DPS. These activities have resulted in decreases in population resiliency and species redundancy.

Wind Energy Development and Power Lines

Wind power is a form of renewable energy increasingly being used to meet current and projected future electricity demands in the United States. Much of the new wind energy development is likely to come from the Great Plains States because they have high wind resource potential, which exerts a strong, positive influence on the amount of wind energy developed within a particular State (Staid and Guikema 2013, p. 384). In 2019, three of the five States within the lesser prairie-chicken range (Colorado, New Mexico, and Kansas) were within the top 10 States nationally for fastest growing States for wind generation in the past year (AWEA 2020, p. 33). There is substantial information (Southwest Power Pool 2020) indicating interest by the wind industry in developing wind energy within the range of the lesser prairie-chicken, especially if additional transmission line capacity is constructed. As of May 2020, approximately 1,792 wind turbines were located within the lesser prairie-chicken analysis area (Hoen et al. 2020). Not all areas within the analysis area are habitat for the lesser prairie-chicken, so not all turbines located within the analysis area affect the lesser prairie-chicken and its habitat.

The average size of installed wind turbines and all other size aspects of wind energy development continues to increase (Department of Energy (DOE) 2015, p. 63;

AWEA 2020, p. 87–88; AWEA 2014, entire; AWEA 2015, entire; AWEA 2016, entire; AWEA 2017, entire; AWEA 2018, entire; AWEA 2019, entire; AWEA 2020, entire). Wind energy developments range from 20 to 400 towers, each supporting a single turbine. The individual permanent footprint of a single turbine unit, about 0.75–1 ac (0.3–0.4 ha), is relatively small in comparison with the overall footprint of the entire array (DOE 2008, pp. 110–111). Roads are necessary to access the turbine sites for installation and maintenance. Depending on the size of the wind energy development, one or more electrical substations, where the generated electricity is collected and transmitted on to the power grid, may also be built. Considering the initial capital investment and that the service life of a single turbine is at least 20 years (DOE 2008, p. 16), we expect most wind energy developments to be in place for at least 30 years. Repower of existing wind energy developments at the end of their service life is increasingly common, with 2,803 MW of operating projects partially repowering in 2019 (AWEA 2020, p. 2).

Please see the SSA report for a detailed review of the best available scientific information regarding the potential effects of wind energy development on habitat use by the lesser prairie-chicken (Service 2021, pp. 31–33).

Noise effects to prairie-chickens have been recently explored as a way to evaluate potential negative effects of wind energy development. For a site in Nebraska, wind turbine noise frequencies were documented at less than or equal to 0.73 kHz (Raynor et al. 2017, p. 493), and reported to overlap the range of lek-advertisement vocalization frequencies of lesser prairie-chicken, 0.50–1.0 kHz. Female greater prairie-chickens avoided wooded areas and row crops but showed no response in space use based on wind turbine noise (Raynor et al. 2019, entire). Additionally, differences in background noise and signal-to-noise ratio of boom chorus of leks in relation to distance to turbine have been documented, but the underlying cause and response needs to be further investigated,

especially since the study of wind energy development noise on grouse is almost unprecedented (Whalen et al. 2019, entire).

The effects of wind energy development on the lesser prairie-chicken must also take into consideration the influence of the transmission lines critical to distribution of the energy generated by wind turbines. Transmission lines can traverse long distances across the landscape and can be both above ground and underground, although the vast majority of transmission lines are erected above ground. Most of the impacts to lesser prairie-chicken associated with transmission lines are with the above ground systems. Support structures vary in height depending on the size of the line. Most high-voltage power line towers are 98 to 125 ft (30 to 38 m) high but can be higher if the need arises. Local distribution lines, if erected above ground, are usually much shorter in height but still contribute to fragmentation of the landscape.

The effect of the transmission line infrastructure is typically much larger than the physical footprint of transmission line installation. Transmission lines can indirectly lead to alterations in lesser prairie-chicken behavior and space use (avoidance), decreased lek attendance, and increased predation on lesser prairie-chicken. Transmission lines, particularly due to their length, can be a significant barrier to dispersal of prairie grouse, disrupting movements to feeding, breeding, and roosting areas. Both lesser and greater prairie-chickens avoided otherwise usable habitat near transmission lines and crossed these power lines much less often than nearby roads, suggesting that power lines are a particularly strong barrier to movement (Pruett et al. 2009, pp. 1255–1257). Because lesser prairie-chicken avoid tall vertical structures like transmission lines and because transmission lines can increase predation rates, leks located in the vicinity of these structures may see reduced attendance by new males to the lek, as has been reported for sage-grouse (Braun et al. 2002, pp. 11–13). Decreased probabilities of use by lesser prairie-chicken were shown with the occurrence of more than 0.09 mi (0.15 km) of major

roads, or transmission lines within a 1.2-mi (2-km) radius (Sullins et al. 2019, unpaged). Additionally, a recent study corroborated numerous authors' (Pitman et al. 2005; Pruett et al. 2009; Hagen et al. 2011; Grisham et al. 2014; Hovick et al. 2014a) findings of negative effects of power lines on prairie grouse and reported a minimum avoidance distance of 1,925.8 ft (587 m), which is similar to other studies of lesser prairie-chickens (Plumb et al. 2019, entire).

As part of our geospatial analysis, we calculated the amount of otherwise usable land cover for the lesser prairie-chicken that has been impacted (both direct and indirect impacts) by wind energy development in the current analysis area of the lesser prairie-chicken. We used an impact radii of 5,906 ft (1,800 m) for indirect effects of wind turbines and 2,297 ft (700 m) for indirect effects of transmission lines. Within our analysis area, the following acreages have been identified as impacted due to wind energy development: about 2 percent of the total area in the Short-Grass/CRP, Mixed-Grass, and Shinnery Oak Ecoregions; and no impacts of wind energy development documented currently within the Sand Sagebrush Ecoregion. Rangewide, we estimate about 428,000 ac (173,000 ha) of grassland have been impacted by wind energy development, representing about 2 percent of the total analysis area (Service 2021, Appendix E, Figure E.3). These percentages do not account for overlap that may exist with other features that may have already impacted the landscape.

Additionally, according to our geospatial analysis, the following acreages within the analysis area have been directly or indirectly impacted due to the construction of transmission lines: about 7 percent of the total area in the Short-Grass/CRP Ecoregion; 5 percent of the total area in the Sand Sagebrush Ecoregion; 7 percent of the total area in the Mixed-Grass Ecoregion; and 10 percent of the total area in the Shinnery Oak Ecoregion. Rangewide, we estimate about 1,553,000 ac (629,000 ha) of grassland have

been impacted by transmission lines representing about 7 percent of the total analysis area (Service 2021, Appendix E, Figure E.4).

Wind energy development and transmission lines remove habitat that supports lesser prairie-chicken. The effects of the development extend past the immediate site of the turbines and their associated infrastructure, further impacting habitat and altering behavior of lesser prairie-chicken throughout both the Northern and the Southern DPSs. These activities have resulted in decreases in population resiliency and species redundancy.

Woody Vegetation Encroachment

As discussed in **Background**, habitat selected by lesser prairie-chicken is characterized by expansive regions of treeless grasslands interspersed with patches of small shrubs (Giesen 1998, pp. 3–4); lesser prairie-chicken avoid areas with trees and other vertical structures. Prior to extensive Euro-American settlement, frequent fires and grazing by large, native ungulates helped confine trees like eastern red cedar to river and stream drainages and rocky outcroppings. The frequency and intensity of these disturbances directly influenced the ecological processes, biological diversity, and patchiness typical of Great Plains grassland ecosystems (Collins 1992, pp. 2003–2005; Fuhlendorf and Smeins 1999, pp. 732, 737).

Following Euro-American settlement, increasing fire suppression combined with government programs promoting eastern red cedar for windbreaks, erosion control, and wildlife cover facilitated the expansion of eastern red cedar distribution in grassland areas (Owensby et al. 1973, p. 256; DeSantis et al. 2011, p. 1838). Once a grassland area has been colonized by eastern red cedar, the trees are mature within 6 to 7 years and provide a plentiful source of seed so that adjacent areas can readily become infested with eastern red cedar. Despite the relatively short viability of the seeds (typically only one growing season), the large cone crop, potentially large seed dispersal ability, and the physiological

adaptations of eastern red cedar to open, relatively dry sites help make the species a successful invader of grassland landscapes (Holthuijzen et al. 1987, p. 1094). Most trees are relatively long-lived and, once they become established in grassland areas, require intensive management to remove to return areas to a grassland state.

Within the southern- and westernmost portions of the estimated historical and occupied ranges of lesser prairie-chicken in Eastern New Mexico, Western Oklahoma, and the South Plains and Panhandle of Texas, honey mesquite is another common woody invader within these grasslands (Riley 1978, p. vii; Boggie et al. 2017, entire). Mesquite is a particularly effective invader in grassland habitat due to its ability to produce abundant, long-lived seeds that can germinate and establish in a variety of soil types and moisture and light regimes (Lautenbach et al. 2017, p. 84). Though not as widespread as mesquite or eastern red cedar, other tall, woody plants, such as redberry or Pinchot juniper (*Juniperus pinchotii*), black locust *(Robinia pseudoacacia*), Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) can also be found in grassland habitat historically and currently used by lesser prairie-chicken and may become invasive in these areas.

Invasion of grasslands by opportunistic woody species causes otherwise usable grassland habitat to no longer be used by lesser prairie-chicken and contributes to the loss and fragmentation of grassland habitat (Lautenbach 2017, p. 84; Boggie et al. 2017, p. 74). In Kansas, lesser prairie-chicken are 40 times more likely to use areas that had no trees than areas with 1.6 trees per ac (5 trees per ha), and no nests occur in areas with a tree density greater than 0.8 trees per ac (2 trees per ha), at a scale of 89 ac (36 ha) (Lautenbach 2017, pp. 104–142). Similarly, within the Shinnery Oak Ecoregion, lesser prairie-chicken space use in all seasons is altered in the presence of mesquite, even at densities of less than 5 percent canopy cover (Boggie et al. 2017, entire). Woody vegetation encroachment also contributes to indirect habitat loss and increases habitat

fragmentation because lesser prairie-chicken are less likely to use areas adjacent to trees (Boggie et al. 2017, pp. 72–74; Lautenbach 2017, pp. 104–142).

Fire is often the best method to control or preclude tree invasion of grassland. However, to some landowners and land managers, burning of grassland can be perceived as a high-risk activity because of the potential liability of escaped fire impacting nontarget lands and property. Additionally, it is undesirable for optimizing cattle production and is likely to create wind erosion or "blowouts" in sandy soils. Consequently, wildfire suppression is common, and relatively little prescribed burning occurs on private land. Often, prescribed fire is employed only after significant tree invasion has already occurred and landowners consider forage production for cattle to have diminished. Preclusion of woody vegetation encroachment on grasslands of the southern Great Plains using fire requires implementing fire at a frequency that mimics historical fire frequencies of 2–14 years (Guyette et al. 2012, p. 330), further limiting the number of landowners able to implement fire in a manner that would truly preclude future encroachment. Additionally, in areas where grazing pressure is heavy and fuel loads are reduced, a typical grassland fire may not be intense enough to eradicate eastern red cedar (Briggs et al. 2002a, p. 585; Briggs et al. 2002b, p. 293; Bragg and Hulbert 1976, p. 19) and will not eradicate mesquite.

As part of our geospatial analysis, we calculated the amount of woody vegetation encroachment in the current analysis area of the lesser prairie-chicken. These calculations of the current analysis area do not include historical impacts of habitat loss that occurred outside of the current analysis area; thus, it likely underestimates the effects of historical woody vegetation encroachment rangewide on the lesser prairie-chicken. An additional limitation associated with this calculation is that available remote sensing data lack the ability to detect areas with low densities of encroachment, as well as areas with shorter trees; thus, this calculation likely underestimates lesser prairie-chicken habitat loss due to

woody vegetation encroachment. The identified areas of habitat impacted by woody vegetation are: about 5 percent of the total area in the Short-Grass/CRP Ecoregion; about 2 percent of the total area in the Sand Sagebrush Ecoregion; about 24 percent of the total area in the Mixed-Grass Ecoregion; and about 17 percent of the total area in the Shinnery Oak Ecoregion. Rangewide, we estimate about 3,071,000 ac (1,243,000 ha) of grassland have been directly or indirectly impacted by the encroachment of woody vegetation, or about 18 percent of the total area. These percentages do not account for overlap that may exist with other features that may have already impacted the landscape. Further information, including total acres impacted, is available in the SSA report (Service 2021, Appendix B; Appendix E, Figure E.5).

Woody vegetation encroachment is contributing to ongoing habitat loss as well as contributing to fragmentation and degradation of remaining habitat patches. The effects of woody vegetation encroachment are particularly widespread in the Shinnery Oak Ecoregion that makes up the Southern DPS as well as the Mixed-Grass Ecoregion of the Northern DPS. While there are ongoing efforts to control woody vegetation encroachment, the current level of woody vegetation on the landscape is evidence that removal efforts are being outpaced by rates of encroachment, thus we expect that this threat will continue to contribute to habitat loss and fragmentation, which has reduced population resiliency across the range of the lesser prairie-chicken.

Roads and Electrical Distribution Lines

Roads and distribution power lines are linear features on the landscape that contribute to loss and fragmentation of lesser prairie-chicken habitat and fragment populations as a result of behavioral avoidance. Lesser prairie-chickens are less likely to use areas close to roads (Plumb et al. 2019, entire; Sullins et al. 2019, entire). Additionally, roads contribute to lek abandonment when they disrupt important habitat features (such as affecting auditory or visual communication) associated with lek sites

(Crawford and Bolen 1976b, p. 239). Some mammal species that prey on lesser prairie-chicken, such as red fox (*Vulpes vulpes*), raccoons (*Procyon lotor*), and striped skunks (*Mephitis mephitis*), have greatly increased their distribution by dispersing along roads (Forman and Alexander 1998, p. 212; Forman 2000, p. 33; Frey and Conover 2006, pp. 1114–1115).

Traffic noise from roads may indirectly impact lesser prairie-chicken. Because lesser prairie-chicken depend on acoustical signals to attract females to leks, noise from roads, oil and gas development, wind turbines, and similar human activity may interfere with mating displays, influencing female attendance at lek sites and causing young males not to be drawn to the leks. Within a relatively short period, leks can become inactive due to a lack of recruitment of new males to the display grounds. For further discussion on noise, please see *Influence of Anthropogenic Noise*.

Depending on the traffic volume and associated disturbances, roads also may limit lesser prairie-chicken dispersal abilities. Lesser prairie-chickens avoid areas of usable habitat near roads (Pruett et al. 2009, pp. 1256, 1258; Plumb et al. 2019, entire) and in areas where road densities are high (Sullins et al. 2019, p. 8). Lesser prairie-chickens are thought to avoid major roads due to disturbance caused by traffic volume and perhaps to avoid exposure to predators that may use roads as travel corridors. However, the extent to which roads constitute a significant obstacle to lesser prairie-chicken movement and space use is largely dependent upon the local landscape composition and characteristics of the road itself.

Local electrical distribution lines are usually much shorter in height than transmission lines but can still contribute to habitat fragmentation through similar mechanisms as other vertical features when erected above ground. Distribution lines are similar to transmission lines with the exception to height of poles and electrical power carried through the line. In addition to habitat loss and fragmentation, electrical power

lines can directly affect prairie grouse by posing a collision hazard (Leopold 1933, p. 353; Connelly et al. 2000, p. 974). There were no datasets available to quantify the total impact of distribution lines on the landscape for the lesser prairie-chicken. Although distribution lines are a significant landscape feature throughout the Great Plains with potential to affect lesser prairie-chicken habitat, after reviewing all available information, we were unable to develop a method to quantitatively incorporate the occurrence of distribution lines into our geospatial analysis.

As part of our geospatial analysis, we estimated the area impacted by direct and indirect habitat loss due to roads (Service 2021, Appendix B, Part 2). These calculations of the current analysis area do not include historical impacts of loss; thus, it likely underestimates the historical effect of roads on rangewide habitat loss for the lesser prairie-chicken. The results indicate that the total areas of grassland that have been directly and indirectly impacted by roads within the analysis area for the lesser prairie-chicken are: about 17 percent of the total area in the Short-Grass/CRP Ecoregion; about 14 percent of the total area in the Sand Sagebrush Ecoregion; about 20 percent of the total area in the Mixed-Grass Ecoregion; and about 19 percent of the total area in the Shinnery Oak Ecoregion. Rangewide, we estimate about 3,996,000 ac (1,617,000 ha) of grassland have been impacted by roads, representing about 18 percent of the total analysis area (Service 2021, Appendix E, Figure E.6). We did not have adequate spatial data to evaluate habitat loss caused solely by power lines, but much of the existing impacts of power lines occur within the impacts caused by roads. Power lines that fall outside the existing impacts of roads would represent additional impacts for the lesser prairie-chicken that are not quantified in our geospatial analysis.

Development of roads and electrical distribution lines directly removes habitat that supports lesser prairie-chicken, and the effects of the development extend past the immediate footprint of the development, further impacting habitat and altering behavior

of lesser prairie-chicken throughout both the Northern and the Southern DPSs. These activities have resulted in decreases in population resiliency and species redundancy.

Other Factors

Livestock Grazing

Grazing has long been an ecological driving force throughout the ecosystems of the Great Plains (Stebbins 1981, p. 84), and much of the untilled grasslands within the range of the lesser prairie-chicken is currently grazed by livestock and other animals. Historically, the interaction of fire, drought, prairie dogs (*Cynomys ludovicianus*), and large ungulate grazers created and maintained distinctive plant communities in the Western Great Plains, resulting in a mosaic of vegetation structure and composition that sustained lesser prairie-chicken and other grassland bird populations (Derner et al. 2009, p. 112). As such, grazing by domestic livestock is not inherently detrimental to lesser prairie-chicken management and, in many cases, is needed to maintain appropriate vegetative structure.

However, grazing practices that tend to result in overutilization of forage and decreasing vegetation heterogeneity can produce habitat conditions that differ in significant ways from the historical grassland mosaic; these incompatible practices alter the vegetation structure and composition and degrade the quality of habitat for the lesser prairie-chicken. The more heavily altered conditions are the least valuable for the lesser prairie-chicken (Jackson and DeArment 1963 p. 733; Davis et al. 1979, pp. 56, 116; Taylor and Guthery 1980a, p. 2; Bidwell and Peoples 1991, pp. 1–2). In some cases, these alterations can result in areas that do not contain the biological components necessary to support the lesser prairie-chicken.

Where grazing regimes leave limited residual cover in the spring, protection of lesser prairie-chicken nests may be inadequate, and desirable food resources can be scarce (Bent 1932, p. 280; Cannon and Knopf 1980, pp. 73–74; Crawford 1980, p. 3;

Kraft 2016, pp. 19–21). Because lesser prairie-chicken depend on medium- and tall-grass species for nesting, concealment, and thermal cover that are also preferentially grazed by cattle, these plant species needed by lesser prairie-chicken can easily be reduced or eliminated by cattle grazing, particularly in regions of low rainfall (Hamerstrom and Hamerstrom 1961, p. 290). In addition, when grasslands are in a deteriorated condition due to incompatible grazing and overutilization, the soils have less water-holding capacity (Blanco and Lal 2010, p. 9), and the availability of succulent vegetation and insects used by lesser prairie-chicken chicks is reduced. However, grazing can be beneficial to the lesser prairie-chicken when management practices produce or enhance the vegetative characteristics required by the lesser prairie-chicken.

The interaction of fire and grazing and its effect on vegetation components and structure is likely important to prairie-chickens (Starns et al. 2020, entire). On properties managed with patch-burn grazing regimes, female greater prairie-chickens selected areas with low cattle stocking rates and patches that were frequently burned, though they avoided areas that were recently burned (Winder et al. 2017, p. 171). Patch-burn grazing created preferred habitats for female greater prairie-chickens if the regime included a relatively frequent fire-return interval, a mosaic of burned and unburned patches, and a reduced stocking rate in unburned areas avoided by grazers. When managed compatibly, widespread implementation of patch-burn grazing could result in significant improvements in habitat quality for wildlife in the tall-grass prairie ecosystem (Winder et al. 2017, p. 165). In the eastern portion of the lesser prairie-chicken range, patch-burn grazing resulted in patchy landscapes with variation in vegetation composition and structure (Lautenbach 2017, p. 20). Female lesser prairie-chickens' use of the diversity of patches in the landscape varied throughout their life cycle. They selected patches with the greatest time-since-fire and subsequently the most visual obstruction for nesting, and they

selected sites with less time-since-fire and greater bare ground and forbs for summer brooding.

Livestock also inadvertently flush lesser prairie-chicken and trample lesser prairie-chicken nests (Toole 2005, p. 27; Pitman et al. 2006, pp. 27–29). Brief flushing of adults from nests can expose eggs and chicks to predation and extreme temperatures. Trampling nests can cause direct mortality to lesser prairie-chicken eggs or chicks or may cause adults to permanently abandon their nests, ultimately resulting in loss of young. Although these effects have been documented, the significance of direct livestock effects on the lesser prairie-chicken is largely unknown and is presumed not to be significant at a population scale.

In summary, domestic livestock grazing (including management practices commonly used to benefit livestock production) has altered the composition and structure of grassland habitat, both currently and historically, used by the lesser prairie-chicken. Much of the remaining remnants of mixed-grass grasslands, while still important to the lesser prairie-chicken, exhibit conditions quite different from those prior to Euro-American settlement. These changes have reduced the suitability of remnant grassland areas as habitat for lesser prairie-chicken. Grazing management that has altered the vegetation community to a point where the composition and structure are no longer suitable for lesser prairie-chicken can contribute to fragmentation within the landscape, even though these areas may remain as prairie or grassland. Livestock grazing, however, is not inherently detrimental to lesser prairie-chicken provided that grazing management results in a plant community diversity and structure that is suitable for lesser prairie-chicken.

While domestic livestock grazing is a dominant land use on untilled range land within the lesser prairie-chicken analysis area, geospatial data do not exist at a scale and resolution necessary to calculate the total amount of livestock grazing that is being

managed in a way that results in habitat conditions that are not compatible with the needs of the lesser prairie-chicken. Therefore, we did not attempt to spatially quantify the scope of grazing effects across the lesser prairie-chicken range.

Shrub Control and Eradication

Shrub control and eradication are additional forms of habitat alteration that can influence the availability and suitability of habitat for lesser prairie-chicken (Jackson and DeArment 1963, pp. 736–737). Most shrub control and eradication efforts in lesser prairie-chicken habitat are primarily focused on sand shinnery oak for the purpose of increasing forage for livestock grazing. Sand shinnery oak is toxic if eaten by cattle when it first produces leaves in the spring and competes with more palatable grasses and forbs for water and nutrients (Peterson and Boyd 1998, p. 8), which is why it is a common target for control and eradication efforts by rangeland managers. Prior to the late 1990s, approximately 100,000 ac (40,000 ha) of sand shinnery oak in New Mexico and approximately 1,000,000 ac (405,000 ha) of sand shinnery oak in Texas were lost due to the application of tebuthiuron and other herbicides for agriculture and range improvement (Peterson and Boyd 1998, p. 2).

Shrub cover is an important component of lesser prairie-chicken habitat in certain portions of the range, and sand shinnery oak is a key shrub in the Shinnery Oak and portions of the Mixed-Grass Ecoregions. The importance of sand shinnery oak as a component of lesser prairie-chicken habitat in the Shinnery Oak Ecoregion has been demonstrated by several studies (Fuhlendorf et al. 2002, pp. 624–626; Bell 2005, pp. 15, 19–25). In West Texas and New Mexico, lesser prairie-chicken avoid nesting where sand shinnery oak has been controlled with tebuthiuron, indicating their preference for habitat with a sand shinnery oak component (Grisham et al. 2014, p. 18; Haukos and Smith 1989, p. 625; Johnson et al. 2004, pp. 338–342; Patten and Kelly 2010, p. 2151). Where sand shinnery oak occurs, lesser prairie-chicken use it both for food and cover. Sand

shinnery oak may be particularly important in drier portions of the range that experience more severe and frequent droughts and extreme heat events, as sand shinnery oak is more resistant to drought and heat conditions than are most grass species. And because sand shinnery oak is toxic to cattle and thus not targeted by grazing, it can provide available cover for lesser prairie-chicken nesting and brood rearing during these extreme weather events. Loss of this component of the vegetative community likely contributed to observed population declines in lesser prairie-chicken in these areas.

While relatively wide-scale shrub eradication has occurred in the past, geospatial data do not exist to evaluate the extent to which shrub eradication has contributed to the habitat loss and fragmentation for the lesser prairie-chicken and, therefore, was not included in our quantitative analysis. While current efforts of shrub eradication are not likely occurring at rates equivalent to that witnessed in the past, any additional efforts to eradicate shrubs that are essential to lesser prairie-chicken habitat will result in additional habitat degradation and thus reduce redundancy and resiliency.

Influence of Anthropogenic Noise

Anthropogenic noise can be associated with almost any form of human activity, and lesser prairie-chicken may exhibit behavioral and physiological responses to the presence of noise. In prairie-chickens, the “boom” call vocalization transmits information about sex, territorial status, mating condition, location, and individual identity of the signaler and thus is important to courtship activity and long-range advertisement of the display ground (Sparling 1981, p. 484). The timing of displays and frequency of vocalizations are critical reproductive behaviors in prairie grouse and appear to have developed in response to unobstructed conditions prevalent in prairie habitat and indicate that effective communication, particularly during the lekking season, operates within a fairly narrow set of acoustic conditions. Prairie grouse usually initiate displays on the lekking grounds around sunrise, and occasionally near sunset, corresponding with times

of decreased wind turbulence and thermal variation (Sparling 1983, p. 41). Considering the narrow set of acoustic conditions in which communication appears most effective for breeding lesser prairie-chicken and the importance of communication to successful reproduction, human activities that result in noises that disrupt or alter these conditions could result in lek abandonment (Crawford and Bolen 1976b, p. 239). Anthropogenic features and related activities that occur on the landscape can create noise that exceeds the natural background or ambient level. When the behavioral response to noise is avoidance, as it often is for lesser prairie-chicken, noise can be a source of habitat loss or degradation leading to increased habitat fragmentation.

Anthropogenic noise may be a possible factor in the population declines of other species of lekking grouse in North America, particularly for populations that are exposed to human developments (Blickley et al. 2012a, p. 470; Lipp and Gregory 2018, pp. 369–370). Male greater prairie-chicken adjust aspects of their vocalizations in response to wind turbine noise, and wind turbine noise may have the potential to mask the greater prairie-chicken chorus at 296 hertz (Hz) under certain scenarios, but the extent and degree of masking is uncertain (Whalen 2015, entire). Noise produced by typical oil and gas infrastructure can mask grouse vocalizations, compromise the ability of female sage-grouse to find active leks when such noise is present, and affect nest site selection (Blickley and Patricelli 2012, p. 32; Lipp 2016, p. 40). Chronic noise associated with human activity leads to reduced male and female attendance at noisy leks. Breeding, reproductive success, and ultimately recruitment in areas with human developments could be impaired by such developments, impacting survival (Blickley et al. 2012b, entire). Because opportunities for effective communication on the display ground occur under fairly narrow conditions, disturbance during this period may have negative consequences for reproductive success. Other communications used by grouse off the lek,

such as parent-offspring communication, may continue to be susceptible to masking by noise from human infrastructure (Blickley and Patricelli 2012, p. 33).

No data are available to quantify the areas of lesser prairie-chicken habitat rangewide that have been affected by noise, but noise is a threat that is almost entirely associated with anthropogenic features such as roads or energy development. Therefore, through our accounting for anthropogenic features we may have inherently accounted for all or some of the response of the lesser prairie-chicken to noise produced by those features.

Overall, persistent anthropogenic noise could cause lek attendance to decline, disrupt courtship and breeding activity, and reduce reproductive success. Noise can also cause abandonment of otherwise usable habitat and, as a result, contribute to habitat loss and degradation.

Fire

Fire, or its absence, is understood to be a major ecological driver of grasslands in the Southern Great Plains (Anderson 2006, entire; Koerner and Collins 2014, entire; Wright and Bailey 1982, pp. 80–137). Fire is an ecological process important to maintaining grasslands by itself and in coupled interaction with grazing and climate. The interaction of these ecological processes results in increasing grassland heterogeneity through the creation of temporal and spatial diversity in plant community composition and structure and associated response of wildlife (Fuhlendorf and Engle 2001, entire; Fuhlendorf and Engle 2004, entire; Fuhlendorf et al. 2017a, pp. 169–196).

Following settlement of the Great Plains, fire management generally emphasized prevention and suppression, often coupled with grazing pressures that significantly reduced and removed fine fuels (Sayre 2017, pp. 61–70). This approach, occurring in concert with settlement and ownership patterns that occurred in most of the Southern Great Plains, meant that the scale of management was relegated to smaller parcels than

historically were affected. This increase in smaller parcels with both intensive grazing and fire suppression resulted in the transformation of landscapes from dynamic heterogeneous to largely static and homogenous plant communities. This simplification of vegetative pattern due to decoupling fire and grazing (Starns et al. 2019, pp. 1–3) changed the number and size of wildfires and ultimately led to declines in biodiversity in the affected systems (Fuhlendorf and Engle 2001, entire).

Changes in patterns of wildfire in the Great Plains have been noted in recent years (Donovan et al. 2017, entire). While these landscapes have a long history of wildfire, large wildfires (greater than 1,000 ac (400 ha)) typically did not occur in recent past decades, and include an increase in the Southern Great Plains of megafires (greater than 100,000 ac (400 km^2)) since the mid-1990s (Lindley et al. 2019, p. 164). Changes have occurred throughout all or portions of the Great Plains in number of large wildfires and season of fire occurrence, as well as increased area burned by wildfire or increasing probability of large wildfires (Donovan et al. 2017, p. 5990). Furthermore, Great Plains land cover dominated by woody or woody/grassland combined vegetation is disproportionately more likely to experience large wildfires, with the greatest increase in both number of fires and of area burned (Donovan et al. 2020a, p. 11). Fire behavior has also been affected such that these increasingly large wildfires are burning under weather conditions (Lindley et al. 2019, entire) that result in greater burned extent and intensity. These shifts in fire parameters and their outcomes have potential consequences for lesser prairie-chicken, including: (1) larger areas of complete loss of nesting habitat as compared to formerly patchy mosaicked burns; and (2) large-scale reduction in the spatial and temporal variation in vegetation structure and composition affecting nesting and brood-rearing habitat, thermoregulatory cover, and predator escape cover.

Effects from fire are expected to be relatively short term (Donovan et al. 2020b, entire, Starns et al. 2020, entire) with plant community recovery time largely predictable

and influenced by pre-fire condition, post-fire weather, and types of management. Some effects from fire, however, such as the response to changing plant communities in the range of the lesser prairie-chicken, will vary based on location within the range and available precipitation. In the eastern extent of the distribution of sand shinnery oak that occurs in the Mixed-Grass Ecoregion, fire has potential negative effects on some aspects of the lesser prairie-chicken habitat for 2 years after the area burns, but these effects could be longer in duration dependent upon precipitation patterns (Boyd and Bidwell 2001, pp. 945–946). Effects from fire on lesser prairie-chicken varied based on fire break preparation, season of burn, and type of habitat; positive effects included improved brood habitat through increased forb and grasshopper abundance, but these can be countered by short-term (2-year) negative effects to quality and availability of nesting habitat and a reduction in food sources (Boyd and Bidwell 2001, pp. 945–946). Birds moved into recently burned landscapes of western Oklahoma for lek courtship displays because of the reduction in structure from formerly dense vegetation (Cannon and Knopf 1979, entire).

More recently, research evaluating indirect effects concluded that prescribed fire and managed grazing following the patch-burn or pyric herbivory (grazing practices shaped fire) approach will benefit lesser prairie-chicken through increases in forbs; invertebrates; and the quality, amount, and juxtaposition of brood habitat to available nesting habitat (Elmore et al. 2017, entire). The importance of temporal and spatial heterogeneity derived from pyric herbivory is apparent in the female lesser prairie-chicken use of all patch types in the patch-burn grazing mosaic, including greater than 2 years post-fire for nesting, 2-year post fire during spring lekking, 1- and 2-year post-fire during summer brooding, and 1-year post-fire during nonbreeding season (Lautenbach 2017, pp. 20–22). While the use of prescribed fire as a tool for managing grasslands throughout the lesser prairie-chicken range is encouraged, current use is at a temporal

frequency and spatial extent insufficient to support large amount of lesser prairie-chicken habitat. These fire management efforts are limited to a small number of fire-minded landowners, resulting in effects to a small percentage of the lesser prairie-chicken range.

While lesser prairie-chicken evolved in a fire-adapted landscape, little research (Thacker and Twidwell 2014, entire) has been conducted on response of lesser prairie-chicken to altered fire regimes. Research to date has focused on site-specific responses and consequences. Human suppression of wildfire and the limited extent of fire use (prescribed fire) for management over the past century has altered the frequency, scale, and intensity of fire occurrence in lesser prairie-chicken habitat. These changes in fire parameters have happened simultaneously with habitat loss and fragmentation, resulting in patchy distribution of lesser prairie-chicken throughout their range. An increase in size, intensity, or severity of wildfires as compared to historical occurrences results in increased vulnerability of isolated, smaller lesser prairie-chicken populations. Both woody plant encroachment and drought are additive factors that increase risk of negative consequences of wildfire ignition, as well as extended post-fire lesser prairie-chicken habitat effects. The extent of these negative impacts can be significantly altered by precipitation patterns following the occurrence of the fire; dry periods will inhibit or extend plant community response.

Historically, fire served an important role in maintenance and quality of habitat for the lesser prairie-chicken. Currently, due to a significant shift in fire regimes in the lesser prairie-chicken range, fire use for management of grasslands plays a locally important but overall limited role in most lesser prairie-chicken habitat. This current lack of prescribed fire use in the range of the lesser prairie-chicken is contributing to woody plant encroachment and degradation of grassland quality due to its decoupling from the grazing and fire interaction that is the foundation for plant community diversity in structure and composition, which in turn supports the diverse habitat needs of lesser

prairie-chicken. These cascading effects contribute to greater wildfire risk, and concerns exist regarding the changing patterns of wildfires (scale, intensity, and frequency) and their consequences for remaining lesser prairie-chicken populations and habitat that are increasingly fragmented. Concurrently, wildfire has increased as a threat rangewide due to compounding influences of increased size and severity of wildfires and the potential consequences to remaining isolated and fragmented lesser prairie-chicken populations.

Extreme Weather Events

Weather-related events such as drought, snow, and hail storms can influence habitat quality or result in direct mortality of lesser prairie-chickens. Although hail storms typically only have a localized effect, the effects of snow storms and drought can often be more widespread and can affect considerable portions of the lesser prairie-chicken range. Drought is considered a universal ecological driver across the Great Plains (Knopf 1996, p. 147). Annual precipitation within the Great Plains is highly variable (Wiens 1974, p. 391), with prolonged drought capable of causing local extinctions of annual forbs and grasses within stands of perennial species; recolonization is often slow (Tilman and El Haddi 1992, p. 263). Grassland bird species in particular are impacted by climate extremes such as extended drought, which acts as a bottleneck that allows only a limited number of individuals to survive through the relatively harsh conditions (Wiens 1974, pp. 388, 397; Zimmerman 1992, p. 92). Drought also interacts with many of the other threats impacting the lesser prairie-chicken and its habitat, such as amplifying the effects of incompatible grazing and predation.

Although the lesser prairie-chicken has adapted to drought as a component of its environment, drought and the accompanying harsh, fluctuating conditions (high temperatures and low food and cover availability) have influenced lesser prairie-chicken populations. Widespread periods of drought commonly result in “bust years” of recruitment. Following extreme droughts of the 1930s, 1950s, 1970s, and 1990s, lesser

prairie-chicken population levels declined and a decrease in their overall range was observed (Lee 1950, p. 475; Ligon 1953, p. 1; Schwilling 1955, pp. 5–6; Hamerstrom and Hamerstrom 1961, p. 289; Copelin 1963, p. 49; Crawford 1980, pp. 2–5; Massey 2001, pp. 5, 12; Hagen and Giesen 2005, unpaginated). Additionally, lesser prairie-chicken populations reached near record lows during and after the more recent drought of 2011 to 2013 (McDonald et al. 2017, p. 12; Fritts et al. 2018, entire).

Drought impacts prairie grouse, such as lesser prairie-chicken, through several mechanisms. Drought affects seasonal growth of vegetation necessary to provide suitable nesting and roosting cover, food, and opportunity for escape from predators (Copelin 1963, pp. 37, 42; Merchant 1982, pp. 19, 25, 51; Applegate and Riley 1998, p. 15; Peterson and Silvy 1994, p. 228; Morrow et al. 1996, pp. 596–597; Ross et al. 2016a, entire). Lesser prairie-chicken home ranges will temporarily expand during drought years (Copelin 1963, p. 37; Merchant 1982, p. 39) to compensate for scarcity in available resources. During these periods, the adult birds expend more energy searching for food and tend to move into areas with limited cover in order to forage, leaving them more vulnerable to predation and heat stress (Merchant 1982, pp. 34–35; Flanders-Wanner et al. 2004, p. 31). Chick survival and recruitment may also be depressed by drought (Merchant 1982, pp. 43–48; Morrow et al. 1996, p. 597; Giesen 1998, p. 11; Massey 2001, p. 12), which likely affects population trends more than annual changes in adult survival (Hagen 2003, pp. 176–177). Drought-induced mechanisms affecting recruitment include decreased physiological condition of breeding females (Merchant 1982, p. 45); heat stress and water loss of chicks (Merchant 1982, p. 46); and effects to hatch success and juvenile survival due to changes in microclimate, temperature, and humidity (Patten et al. 2005, pp. 1274–1275; Bell 2005, pp. 20–21; Boal et al. 2010, p. 11). Precipitation, or lack thereof, appears to affect lesser prairie-chicken adult population trends with a potential lag effect (Giesen 2000, p. 145; Ross et al. 2016a, pp. 6–8). That is, rain levels

in one year promote more vegetative cover for eggs and chicks in the following year, which influences survival and reproduction.

Although lesser prairie-chicken have persisted through droughts in the past, the effects of such droughts are exacerbated by human land use practices such as incompatible grazing and land cultivation (Merchant 1982, p. 51; Hamerstrom and Hamerstrom 1961, pp. 288–289; Davis et al. 1979, p. 122; Taylor and Guthery 1980a, p. 2; Ross et al. 2016b, pp. 183–186) as well as the other threats that have affected the current condition and have altered and fragmented the landscape and decreased population abundances (Fuhlendorf et al. 2002, p. 617; Rodgers 2016, pp. 15–19). In past decades, fragmentation of lesser prairie-chicken habitat was less extensive than it is today, connectivity between occupied areas was more prevalent, and populations were larger, allowing populations to recover more quickly. In other words, lesser prairie-chicken populations were more resilient to the effects of stochastic events such as drought. As lesser prairie-chicken population abundances decline and usable habitat declines and becomes more fragmented, their ability to rebound from prolonged drought is diminished.

Hail storms can cause mortality of prairie grouse, particularly during the spring nesting season. An excerpt from the May 1879 Stockton News that describes a large hailstorm near Kirwin, Kansas, as responsible for killing prairie-chickens (likely greater prairie-chicken) and other birds by the hundreds (Fleharty 1995, p. 241). Although such phenomena are likely rare, the effects can be significant, particularly if they occur during the nesting period and result in significant loss of eggs or chicks. Severe winter storms can also result in localized impacts to lesser prairie-chicken populations. For example, a severe winter storm in 2006 was reported to reduce lesser prairie-chicken numbers in Colorado by 75 percent from 2006 to 2007, from 296 birds observed to only 74. Active leks also declined from 34 leks in 2006 to 18 leks in 2007 (Verquer 2007, p. 2). While

populations commonly rebound to some degree following severe weather events such as drought and winter storms, a population with decreased resiliency becomes susceptible to extirpation from stochastic events.

We are not able to quantify the impact that severe weather has had on the lesser prairie-chicken populations, but, as discussed above, these events have shaped recent history and influenced the current condition for the lesser prairie-chicken.

Regulatory Mechanisms

In Appendix D of the SSA report (Service 2021), we review in more detail the existing regulatory mechanisms (such as local, State, and Federal land use regulations or laws) that may be significant to lesser prairie-chicken conservation. Here, we present a summary of some of those regulatory mechanisms. All existing regulatory mechanisms were fully considered in our conclusion about the status of the two DPSs.

All five States in the estimated occupied range have incorporated the lesser prairie-chicken as a species of conservation concern and management priority in their respective State Wildlife Action Plans. While identification of the lesser prairie-chicken as a species of conservation concern helps heighten public awareness, this designation provides no protection from direct take or habitat destruction or alteration. The lesser prairie-chicken is listed as threatened in Colorado; this listing protects the lesser prairie-chicken from direct purposeful mortality by humans but does not provide protections for destruction or alteration of habitat.

Primary land ownership (approximately 5 percent of total range) at the Federal level is on USFS and BLM lands. The lesser prairie-chicken is present on the Cimarron National Grassland in Kansas and the Comanche National Grassland in Colorado; a total of approximately 3 percent of the total acres estimated in the current condition is on USFS land. The 2014 Lesser Prairie-Chicken Management Plan for these grasslands provides a framework to manage lesser prairie-chicken habitat. The plan provides

separate population and habitat recovery goals for each grassland, as well as vegetation surveys to inform ongoing and future monitoring efforts of suitable habitat and lek activities. Because National Grasslands are managed for multiple uses, the plan includes guidelines for prescribed fire and grazing.

In New Mexico, roughly 41 percent of the known historical and most of the estimated occupied lesser prairie-chicken range occurs on BLM land, for a total of 3 percent of the total acres estimated in the current condition. The BLM established the 57,522-ac (23,278-ha) Lesser Prairie-Chicken Habitat Preservation Area of Critical Environmental Concern (ACEC) upon completion of the Resource Management Plan Amendment (RMPA) in 2008. The management goal for the ACEC is to protect the biological qualities of the area, with emphasis on the preservation of the shinnery oak-dune community to enhance the biodiversity of the ecosystem, particularly habitats for the lesser prairie-chicken and the dunes sagebrush lizard. Upon designation, the ACEC was closed to future oil and gas leasing, and existing leases would be developed in accordance with prescriptions applicable to the Core Management Area as described below (BLM 2008, p. 30). Additional management prescriptions for the ACEC include designation as a right-of-way exclusion area, vegetation management to meet the stated management goal of the area, and limiting the area to existing roads and trails for off-highway vehicle use (BLM 2008, p. 31). All acres of the ACEC have been closed to grazing through relinquishment of the permits except for one 3,442-ac (1,393-ha) allotment.

The BLM's approved RMPA (BLM 2008, pp. 5–31) provides some limited protections for the lesser prairie-chicken in New Mexico by reducing the number of drilling locations, decreasing the size of well pads, reducing the number and length of roads, reducing the number of powerlines and pipelines, and implementing best management practices for development and reclamation. The effect of these best

management practices on the status of the lesser prairie-chicken is unknown, particularly considering about 82,000 ac (33,184 ha) have already been leased in those areas (BLM 2008, p. 8). Although the BLM RMPA is an important tool for identifying conservation actions that would benefit lesser prairie-chicken, this program is not adequate to eliminate threats to the species such that is does not warrant listing under the Act.

No new mineral leases will be issued on approximately 32 percent of Federal mineral acreage within the RMPA planning area (BLM 2008, p. 8), although some exceptions are allowed on a case-by-case basis (BLM 2008, pp. 9–11). Within the Core Management Area and Primary Population Area, new leases will be restricted in occupied and suitable habitat; however, if there is an overall increase in reclaimed to disturbed acres over a 5-year period, new leases in these areas will be allowed (BLM 2008, p. 11). In the southernmost habitat management units, where lesser prairie-chickens are now far less common than in previous decades (Hunt and Best 2004), new leases will not be allowed within 2.4 km (1.5 mi) of a lek (BLM 2008, p. 11).

We conclude that existing regulatory mechanisms have minimal influence on the rangewide trends of lesser prairie-chicken habitat loss and fragmentation because 97 percent of the lesser prairie-chicken analysis area occurs on private lands, and the activities affecting lesser prairie-chicken habitat are largely unregulated land use practices and land development.

Conservation Efforts

The SSA report also includes detailed information on current conservation measures (Service 2021, pp. 49–61). Some programs are implemented across the species' range, and others are implemented at the State or local level. Because the vast majority of lesser prairie-chicken and their habitat occurs on private lands, most of these programs are targeted toward voluntary, incentive-based actions in cooperation with private landowners.

At the rangewide scale, plans include the Lesser Prairie-Chicken Rangewide Conservation Plan, the Lesser Prairie-Chicken Initiative, and the Conservation Reserve Program. Below is a summary of the primary rangewide conservation efforts. For detailed descriptions of each program, please see the SSA report. All existing ongoing conservation efforts were fully considered in our finding on the status of the two DPSs.

In 2013, the State fish and wildlife agencies within the range of the lesser prairie-chicken and the Western Association of Fish and Wildlife Agencies (WAFWA) finalized the Lesser Prairie-Chicken Range-wide Conservation Plan (RWP) in response to concerns about threats to lesser prairie-chicken habitat and resulting effects to lesser prairie-chicken populations (Van Pelt et al. 2013, entire). The RWP established biological goals and objectives as well as a conservation targeting strategy that aims to unify conservation efforts towards common goals. Additionally, the RWP establishes a mitigation framework administered by WAFWA that allows industry participants the opportunity to mitigate unavoidable impacts of a particular activity on the lesser prairie-chicken. After approval of the RWP, WAFWA developed a companion oil and gas candidate conservation agreement with assurances (CCAA), which adopted the mitigation framework contained within the RWP that was approved in 2014.

As of August 1, 2020, WAFWA had used incoming funds from industry participants to place 22 sites totaling 128,230 unimpacted ac (51,893 ha) under conservation contracts to provide offset for industry impacts that have occurred through the RWP and CCAA (Moore 2020, p. 9). These areas are enrolled under RWP conservation contracts that will provide mitigation for 1,538 projects, which impacted 48,743 ac (19,726 ha) (WAFWA 2020, table 32, unpaginated). When enrolling a property, industry participants agree to minimize impacts from projects to lesser prairie-chicken habitat and mitigate for all remaining impacts on the enrolled property. At the end of 2019 in the CCAA, there were 111 active contracts (Certificates of Inclusion) with

6,228,136 ac (2,520,437 ha) enrolled (Moore 2020, p. 4), and in the WAFWA Conservation Agreement there were 52 active WAFWA Conservation Agreement contracts (Certificates of Participation) with 599,626 ac (242,660 ha) enrolled (WAFWA 2020, Table 5 unpaginated). A recent audit of the mitigation program associated with the RWP and CCAA identified several key issues to be resolved within the program to ensure financial stability and effective conservation outcomes (Moore 2020, Appendix E). WAFWA has hired a consultant who is currently working with stakeholders, including the Service, to consider available options to address the identified issues to ensure long-term durability of the strategy.

In 2010, the U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) began implementation of the Lesser Prairie-Chicken Initiative (LPCI). The LPCI provides conservation assistance, both technical and financial, to landowners throughout the LPCI's administrative boundary (NRCS 2017, p. 1). The LPCI focuses on maintenance and enhancement of lesser prairie-chicken habitat while benefiting agricultural producers by maintaining the farming and ranching operations throughout the region. In 2019, after annual declines in landowner interest in LPCI, the NRCS made changes in how LPCI will be implemented moving forward and initiated conferencing under section 7 of the ESA with the Service. Prior to 2019, participating landowners had to address all threats to the lesser prairie-chicken present on their property. In the future, each conservation plan developed under LPCI will only need to include one or more of the core management practices that include prescribed grazing, prescribed burning, brush management, and upland wildlife habitat management. Additional management practices may be incorporated into each conservation plan, as needed, to facilitate meeting the desired objectives. These practices are applied or maintained annually for the life of the practice, typically 1 to 15 years, to treat or manage habitat for lesser prairie-chicken. From 2010 through 2019, NRCS worked with 883

private agricultural producers to implement conservation practices on 1.6 million ac (647,497 ha) of working lands within the historical range of the lesser prairie-chicken (NRCS 2020, p. 2). During that time, through LPCI, NRCS implemented prescribed grazing plans on 680,800 ac (275,500 ha) across the range (Griffiths 2020, pers. comm.). Through LPCI, NRCS has also removed over 41,000 ac (16,600 ha) of eastern red cedar in the Mixed-Grass Ecoregion and chemically treated approximately 106,000 ac (43,000 ha) of mesquite in the Shinnery Oak Ecoregion. Lastly, NRCS has conducted prescribed burns on approximately 15,000 ac (6,000 ha) during this time.

The Conservation Reserve Program (CRP) is administered by the USDA's Farm Service Agency and provides short-term protection and conservation benefits on millions of acres within the range of the lesser prairie-chicken. The CRP is a voluntary program that allows eligible landowners to receive annual rental payments and cost-share assistance in exchange for removing cropland and certain marginal pastureland from agricultural production. CRP contract terms are for 10 to 15 years. The total amount of land that can be enrolled in the CRP is capped nationally by the Food Security Act of 1985, as amended (the 2018 Farm Bill) at 27 million ac (10.93 million ha). All five States within the range of the lesser prairie-chicken have lands enrolled in the CRP. The 2018 Farm Bill maintains the acreage limitation that not more than 25 percent of the cropland in any county can be enrolled in CRP, with specific conditions under which a waiver to this restriction can be provided for lands enrolled under the Conservation Reserve Enhancement Program (84 FR 66813, December 6, 2019). Over time, CRP enrollment fluctuates both nationally and locally. Within the counties that intersect the Estimated Occupied Range plus a 10-mile buffer, acres enrolled in CRP have declined annually since 2007 (with the exception of one minor increase from 2010 to 2011) from nearly 6 million ac (2.4 million ha) enrolled to current enrollment levels of approximately 4.25 million ac (1.7 million ha) (FSA 2020a, unpublished data). More specific to our analysis

area, current acreage of CRP enrollment is approximately 1,822,000 ac (737,000 ha) within our analysis area. Of those currently enrolled acres there are approximately 120,000 ac (49,000 ha) of introduced grasses and legumes dispersed primarily within the Mixed-Grass and Shinnery Oak Ecoregions (FSA 2020b, unpublished data).

At the State level, programs provide direct technical and financial cost-share assistance to private landowners interested in voluntarily implementing conservation management practices to benefit species of greatest conservation need—including the lesser prairie-chicken. Additionally, a variety of State-level conservation efforts acquire and manage lands or incentivize management by private landowners for the benefit of the lesser prairie-chicken. Below is a summary for each State within the range of the lesser prairie-chicken. For a complete description of each, see the SSA report. All conservation measures discussed in the SSA report were fully considered in this proposed rule.

Within the State of Kansas, conservation efforts are administered by the Kansas Department of Wildlife, Parks and Tourism (KDWPT), The Nature Conservancy, and the Service's Partners for Fish and Wildlife Program (PFW). KDWPT has targeted lesser prairie-chicken habitat improvements on private lands by leveraging landowner cost-share contributions, industry and nongovernmental organizations' cash contributions, and agency funds toward several federally funded grant programs. The KDWPT has implemented conservation measures over 22,000 ac (8,900 ha) through the Landowner Incentive Program, over 18,000 ac (7,285 ha) through the State Wildlife Grant Private Landowner Program, 30,000 ac (12,140 ha) through the Wildlife Habitat Incentives Program, and 12,000 ac (4,855 ha) through the Habitat First Program within the range of the lesser prairie-chicken. Additionally, KDWPT was provided an opportunity through contributions from the Comanche Pool Prairie Resource Foundation to leverage additional Wildlife and Sport Fish Restoration funds in 2016 to direct implementation of 19,655 ac (7,954 ha). The Nature Conservancy in Kansas manages the 18,060-ac (7,309-

ha) Smoky Valley Ranch. The Nature Conservancy also serves as the easement holder for nearly 34,000 ac (13,760 ha) of properties that are enrolled under the RWP. The Nature Conservancy is also working to use funds from an NRCS Regional Conservation Partnership Program that have resulted in nearly 50,000 ac (20,235 ha) on three ranches either with secured or in-process conservation easements. The Service's PFW program has executed 95 private lands agreements with direct and indirect improvements on about 173,000 ac (70,011 ha) of private lands benefitting conservation of the lesser prairie-chicken in Kansas.

In 2009, Colorado Parks and Wildlife (CPW) initiated its Lesser Prairie-Chicken Habitat Improvement Program that provides cost-sharing to private landowners who participate in practices such as deferred grazing around active leks, enhancement of fields enrolled in CRP and cropland-to-grassland habitat conversion. Since program inception, CPW has completed 37,051 ac (14,994 ha) of habitat treatments. The Nature Conservancy holds permanent conservation easements on multiple ranches that make up the Big Sandy complex. Totaling approximately 48,940 ac (19,805 ha), this complex is managed with lesser prairie-chicken as a conservation objective and perpetually protects intact sand sagebrush and short-grass prairie communities. The USFS currently manages the Comanche Lesser Prairie-Chicken Habitat Zoological Area, as part of the Comanche and Cimarron National Grasslands, which encompass an area of 10,177 ac (4,118 ha) in Colorado that is managed to benefit the lesser prairie-chicken (USFS 2014, p. 9). In 2016, CPW and KDWPT partnered with Kansas State University and USFS to initiate a 3-year translocation project to restore lesser prairie-chicken to the Comanche National Grasslands (Colorado) and Cimarron National Grasslands (Kansas). Beginning in the fall of 2016 and concluding with the 2019 spring lekking season, the partnership trapped and translocated 411 lesser prairie-chickens from the Short-Grass/CRP Ecoregion in Kansas to the Sand Sagebrush Ecoregion. During April and May 2020 lek counts, Colorado and

Kansas biologists and technicians found 115 male birds on 20 active leks in the landscape around the Comanche and Cimarron National Grasslands (Rossi 2020, pers. comm.).

In 2013, the Oklahoma Department of Wildlife Conservation (ODWC) was issued a 25-year enhancement of survival permit pursuant to section 10(a)(1)(A) of the ESA that included an umbrella CCAA between the Service and ODWC for the lesser prairie-chicken in 14 Oklahoma counties (78 FR 14111, March 4, 2013). As of 2019, there were 84 participants with a total of 399,225 ac (161,561 ha) enrolled in the ODWC CCAA, with 357,654 ac (144,737) enrolled as conservation acres (ODWC 2020). The ODWC owns six wildlife management areas totaling approximately 75,000 ac (30,351 ha) in the range of the lesser prairie-chicken, though only a portion of each wildlife management area can be considered as conservation acres for lesser prairie-chicken. The Service's PFW program has funded a shared position with ODWC for 6 years to conduct CCAA monitoring and, in addition, has provided funding for on-the-ground work in the lesser prairie-chicken range. Since 2017, the Oklahoma PFW program has implemented 51 private lands agreements on about 10,603 ac (4,291 ha) for the benefit of the lesser prairie-chicken in Oklahoma. The Nature Conservancy of Oklahoma manages the 4,050-ac (1,640-ha) Four Canyon Preserve in Ellis County for ecological health to benefit numerous short-grass prairie species, including the lesser prairie-chicken. In 2017, The Nature Conservancy acquired a conservation easement on 1,784 ac (722 ha) in Woods County. The Conservancy is seeking to permanently protect additional acreage in the region through the acquisition of conservation easements.

Texas Parks and Wildlife Department (TPWD) worked with the Service and landowners to develop the first state-wide umbrella CCAA for the lesser prairie-chicken in Texas, which was finalized in 2006. The Texas CCAA covers 50 counties, largely encompassing the Texas Panhandle and South Plains regions. Total landowner participation by the close of January 2020 was 91 properties totaling approximately

657,038 ac (265,894 ha) enrolled in 15 counties (TPWD 2020, entire). The Service's PFW program and the TPWD have actively collaborated on range management programs designed to provide cost-sharing for implementation of habitat improvements for lesser prairie-chicken. The Service provided funding to TPWD to support a Landscape Conservation Coordinator position for the Panhandle and Southern High Plains region, as well as funding to support Landowner Incentive Program projects targeting lesser prairie-chicken habitat improvements (brush control and grazing management) in this region. More than $200,000 of Service funds were committed in 2010, and an additional $100,000 was committed in 2011.

Since 2008, Texas has addressed lesser prairie-chicken conservation on 14,068 ac (5,693 ha) under the Landowner Incentive Program. Typical conservation measures include native plant restoration, control of exotic or invasive vegetation, prescribed burning, selective brush management, and prescribed grazing. The PFW program in Texas has executed 66 private lands agreements on about 131,190 ac (53,091 ha) of privately owned lands for the benefit of the lesser prairie-chicken in Texas. The Nature Conservancy of Texas acquired approximately 10,635 ac (4,303 ha) in Cochran, Terry, and Yoakum Counties. In 2014, The Nature Conservancy donated this land to TPWD. The TPWD acquired an additional 3,402 ac (1,377 ha) contiguous to the Yoakum Dunes Preserve creating the 14,037-ac (5,681-ha) Yoakum Dunes Wildlife Management Area. In 2015, through the RWP process, WAFWA acquired an additional 1,604 ac (649 ha) in Cochran County, nearly 3 mi (5 km) west of the Yoakum Dunes Wildlife Management Area. The land was deeded to TPWD soon after acquisition. In 2016, an additional 320 ac (129 ha) was purchased by TPWD bordering the WAFWA acquired tract creating an additional 1,924-ac (779-ha) property that is being managed as part of the Yoakum Dunes Wildlife Management Area, now at 15,961 ac (6,459 ha).

The BLM's Special Status Species RMPA, which was approved in April 2008, addressed the concerns and future management of lesser prairie-chicken and dunes sagebrush lizard habitats on BLM lands and established the Lesser Prairie-Chicken Habitat Preservation Area of Critical Environmental Concern (BLM 2008, entire). Since the RMPA was approved in 2008, BLM has closed approximately 300,000 ac (121,000 ha) to future oil and gas leasing and closed approximately 850,000 ac (344,000 ha) to wind and solar development (BLM 2008, p. 3). From 2008 to 2020, they have reclaimed 3,500 ac (1,416 ha) of abandoned well pads and associated roads and required burial of power lines within 2 mi (3.2 km) of lesser prairie-chicken leks. Additionally, BLM has implemented control efforts for mesquite on 832,104 ac (336,740 ha) and has plans to do so on an additional 30,000 ac (12,141 ha) annually. In 2010, BLM acquired 7,440 ac (3,010 ha) of land east of Roswell, New Mexico, to complete the 54,000-ac (21,853-ha) ACEC for lesser prairie-chicken, which is managed to protect key habitat.

Following approval of the RMPA, a candidate conservation agreement (CCA) and CCAA was drafted by a team including the Service, BLM, Center of Excellence for Hazardous Material Management (CEHMM), and participating cooperators to address the conservation needs of the lesser prairie-chicken and the dunes sagebrush lizard. Since the CCA and CCAA were finalized in 2008, 43 oil and gas companies have enrolled a total of 1,964,163 ac (794,868 ha) in the historical range of the lesser prairie-chicken. In addition, 72 ranchers in New Mexico and the New Mexico Department of Game and Fish have enrolled a total of 2,055,461 ac (831,815 ha). The New Mexico State Land Office has enrolled a total of 406,673 ac (164,575 ha) in the historical range of the lesser prairie-chicken. The CCA and CCAA have treated 79,297 ac (32,090 ha) of mesquite and reclaimed 154 abandoned well pads and associated roads. CEHMM has also removed 7,564 ac (3,061 ha) of dead, standing mesquite, and has another 12,000 ac (5,000 ha) scheduled in the upcoming 2 years.

The Nature Conservancy owns and manages the 28,000-ac (11,331-ha) Milnesand Prairie Preserve near Milnesand, New Mexico. Additionally, the New Mexico Department of Game and Fish has designated 30 Prairie Chicken Areas (PCAs) specifically for management of the lesser prairie-chicken ranging in size from 28 to 7,189 ac (11 to 2,909 ha) and totaling more than 27,262 ac (11,033 ha). In 2007, the State Game Commission used New Mexico State Land Conservation Appropriation funding to acquire 5,285 ac (2,137 ha) of private ranchland in Roosevelt County. The Service's PFW program in New Mexico has contributed financial and technical assistance for restoration and enhancement activities benefitting the lesser prairie-chicken in New Mexico. In 2016, the PFW program executed a private land agreement on 630 ac (255 ha) for treating invasive species with a prescribed burn. In 2020 the PFW program executed a private land agreement for a prescribed burn on 155 ac (63 ha).

Conditions and Trends

Rangewide Trends

The lesser prairie-chicken estimated historical range encompasses an area of approximately 115 million ac (47 million ha). As discussed in **Background**, not all of the area within this historical range was evenly occupied by lesser prairie-chicken, and some of the area may not have been suitable to regularly support lesser prairie-chicken populations (Boal and Haukos 2016, p. 6). However, the current range of the lesser prairie-chicken has been significantly reduced from the historical range, and estimates of the reduction vary from greater than 90 percent (Hagen and Giesen 2005, unpaginated) to approximately 83 percent (Van Pelt et al. 2013, p. 3).

We estimated the current amount and configuration of potential lesser prairie-chicken usable area within the analysis area using the geospatial analysis described in the SSA report (Service 2021, Section 3.2; Appendix B, Parts 1, 2, and 3) and considering existing impacts as described above. The total area of all potential usable (land cover that

may be consistent with lesser prairie-chicken areas that have the potential to support lesser prairie-chicken use) and potential usable, unimpacted land cover (that is, not impacted by landscape features) categories in each ecoregion and rangewide is shown in Table 1.

To assess lesser prairie-chicken habitat at a larger scale and incorporate some measure of connectivity and fragmentation, we then grouped the areas of potential usable, unimpacted land cover based on the proximity of other areas with potential usable, unimpacted lesser prairie-chicken land cover. To do this, we used a "nearest neighbor" geospatial process to determine how much potential usable land cover is within 1 mi (1.6 km) of any area of potential usable land cover. This nearest neighbor analysis gives an estimate of how closely potential usable, unimpacted land cover is clustered together, versus spread apart, from other potential usable, unimpacted land cover. Areas with at least 60 percent potential usable, unimpacted land cover within 1 mi (1.6 km) were grouped. The 60 percent threshold was chosen because maintaining grassland in large blocks is vital to conservation of the species (Ross et al. 2016a, entire; Hagen and Elmore 2016, entire; Spencer et al. 2017, entire; Sullins et al. 2019, entire), and these studies indicate that landscapes consisting of greater than 60% grassland are required to support lesser prairie-chicken populations. This approach eliminates small, isolated, and fragmented patches of otherwise potential usable land cover that are not likely to support persistent populations of the lesser prairie-chicken. A separate analysis found that the areas with 60 percent or greater unimpacted potential usable land cover within 1 mile (1.6 km) captured approximately 90 percent of known leks (Service 2021, Appendix B, Part 3).

TABLE 1.—RESULTS OF LESSER PRAIRIE-CHICKEN GEOSPATIAL ANALYSIS BY ECOREGION AND RANGEWIDE, ESTIMATING TOTAL AREA IN ACRES, POTENTIAL USABLE AREA, AND AREA CALCULATED BY OUR NEAREST NEIGHBOR ANALYSIS. (ALL NUMBERS ARE IN ACRES. NUMBERS MAY NOT SUM DUE TO ROUNDING.)

Ecoregion	Ecoregion Total Area	Potential Usable Area	Nearest Neighbor Analysis	Percent of Total Area
Short-Grass/CRP	6,298,014	2,961,318	1,023,894	16.3%
Mixed-Grass	8,527,718	6,335,451	994,483	11.7%
Sand Sagebrush	3,153,420	1,815,435	1,028,523	32.6%
Northern DPS total	**17,979,152**	**11,112,204**	**3,046,900**	**16.9%**
Shinnery Oak (Southern DPS total)	**3,850,209**	**2,626,305**	**1,023,572**	**26.6%**
Rangewide Totals	**21,829,361**	**13,738,509**	**4,070,472**	**18.6%**

The results of the nearest neighbor analysis indicate that about 19 percent of the entire analysis area and from 12 percent to 33 percent within each of the four ecoregions is available for use by the lesser prairie-chicken. Due to limitations in data availability and accuracy as well as numerous limitations with the methodology and assumptions made for this analysis, this estimate should not be viewed as a precise measure of the lesser prairie-chicken habitat; instead, it provides a generalized baseline to characterize the current condition and by which we can then forecast the effect of future changes.

In the SSA report, we also considered trends in populations. Estimates of population abundance prior to the 1960s are indeterminable and rely almost entirely on anecdotal information (Boal and Haukos 2016, p. 6). While little is known about precise historical population sizes, the lesser prairie-chicken was reported to be quite common throughout its range in the early 20th century (Bent 1932, pp. 280–281, 283; Baker 1953, p. 8; Bailey and Niedrach 1965, p. 51; Sands 1968, p. 454; Fleharty 1995, pp. 38–44; Robb and Schroeder 2005, p. 13). In the 1960s, State fish and wildlife agencies began routine lesser prairie-chicken monitoring efforts that have largely continued to today.

In the SSA report and this proposed rule, we discuss lesser prairie-chicken population estimates from two studies. The first study calculated historical trends in lesser prairie-chicken abundances from 1965 through 2016 based on population reconstruction methods and historical lek surveys (Hagen et al. 2017, pp. 6–9). The results of these estimates indicate that lesser prairie-chicken rangewide abundance (based on a minimum estimated number of male lesser prairie-chicken) peaked from 1965–1970 at a mean estimate of about 175,000 males. The mean population estimates maintained levels of greater than 100,000 males until 1989, after which they steadily declined to a low of 25,000 males in 1997 (Garton *et al*. 2016, p. 68). The mean population estimates following 1997 peaked again at about 92,000 males in 2006 but subsequently declined to 34,440 males in 2012. The Service identified concerns in the past with some of the methodologies and assumptions made in this analysis, and the challenges of these data are noted in other studies (for example, Zavaleta and Haukos 2013, p. 545; Cummings et al. 2017, pp. 29–30). While these concerns remain, including the very low sample sizes particularly in the 1960s, this work represents the only attempt to compile the extensive historical ground lek count data collected by State agencies to estimate rangewide population sizes. Approximate distribution of lek locations as reported by WAFWA for the entire range that were observed occupied by lesser prairie-chicken at least once between 2015 and 2019 are shown in the SSA report (Service 2021, Appendix E, Figure E.7).

Following development of aerial survey methods (McRoberts et al. 2011, entire), more statistically rigorous estimates of lesser prairie-chicken abundance (both males and females) have been conducted by flying aerial line-transect surveys throughout the range of the lesser prairie-chicken and extrapolating densities from the surveyed area to the rest of the range beginning in 2012 (Nasman et al. 2020, entire). The aerial survey results from 2012 through 2020 (Service 2021, Figure 3.2) estimated the lesser prairie-chicken

population abundance, averaged over the most recent 5 years of surveys (2015–2020, no surveys in 2019), at 27,384 (90 percent CI: 15,690, 59,981) (Nasman et al. 2020, p. 21; Table 2). The results of these survey efforts should not be taken as precise estimates of the annual lesser prairie-chicken population abundance, as indicated by the large confidence intervals. Thus, the best use of this data is for long-term trend analysis rather than for conclusions based on annual fluctuations. As such, we report the population estimate for the current condition as the average of the past 5 years of surveys.

TABLE 2.—RANGEWIDE AND ECOREGIONAL ESTIMATED LESSER PRAIRIE-CHICKEN TOTAL POPULATION SIZES AVERAGED FROM 2015 TO 2020, LOWER AND UPPER 90 PERCENT CONFIDENCE INTERVALS (CI) OVER THE 5 YEARS OF ESTIMATES, AND PERCENT OF RANGEWIDE TOTALS FOR EACH ECOREGION (FROM NASMAN *ET AL*. 2020, P. 21). NO SURVEYS WERE CONDUCTED IN 2019.

Ecoregion	5-year Average Estimate	5-year Minimum Lower CI	5-year Maximum Upper CI	Percent of Total
Short-Grass/CRP	**16,957**	13,605	35,350	**62%**
Mixed-Grass	**6,135**	1,719	11,847	**22%**
Sand Sagebrush	**1,215**	196	4,547	**4%**
Shinnery Oak	**3,077**	170	8,237	**11%**
Rangewide Totals	**27,384**	15,690	59,981	**100%**

We now discuss habitat impacts and population trends in each ecoregion and DPS throughout the range of the lesser prairie-chicken.

Southern DPS

Using our geospatial analysis, we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of the Shinnery Oak Ecoregion. Of the sources of habitat loss and fragmentation that have occurred, cropland conversion, roads, and encroachment of woody vegetation had the largest impacts on land cover in the Southern DPS (Table 3). Based on our nearest neighbor analysis, we estimated there are approximately 1,023,572 ac (414,225 ha) or 27 percent of the ecoregion and the Southern DPS potentially available for use by lesser prairie-chicken (Table 1).

TABLE 3.—ESTIMATED AREAS OF CURRENT DIRECT AND INDIRECT IMPACTS, BY IMPACT SOURCE, AND THE PROPORTION OF THE TOTAL AREA OF THE SHINNERY OAK ECOREGION ESTIMATED TO BE IMPACTED (SEE TABLE 1 FOR TOTALS). (IMPACTS ARE NOT NECESSARILY CUMULATIVE BECAUSE OF OVERLAP OF SOME IMPACTED AREAS BY MORE THAN ONE IMPACT SOURCE.)

Shinnery Oak Ecoregion (Southern DPS)		
Impact Sources	**Acres**	**% of Ecoregion**
Cropland Conversion	540,120	14%
Petroleum Production	161,652	4%
Wind Energy Development	90,869	2%
Transmission Lines	372,577	10%
Woody Vegetation Encroachment	617,885	16%
Roads	742,060	19%
Total Ecoregion/Southern DPS Area	**3,850,209**	

Based on population reconstruction methods, the mean population estimate ranged between about 5,000 to 12,000 males through 1980, increased to 20,000 males in the mid-1980s and declined to ~1,000 males in 1997 (Hagen et al. 2017, pp. 6–9). The mean population estimate peaked again to ~15,000 males in 2006 and then declined again to fewer than 3,000 males in the mid-2010s.

Aerial surveys have been conducted to estimate lesser prairie-chicken population abundance since 2012, and results in the Shinnery Oak Ecoregion from 2012 through 2020 (Service 2021, Figure 3.10) indicate that this ecoregion has the third highest population size (Nasman et al. 2020, p. 21) of the four ecoregions. Average estimates from 2015 to 2020 are 3,077 birds (90 percent CI: 170, 8,237), representing about 11 percent of the rangewide total (Table 2). Recent estimates have varied between fewer than 1,000 birds in 2015 to more than 5,000 birds in 2020 (see also Service 2021, Appendix E, Figure E.7).

Northern DPS

Prairies of the Short-Grass/CRP Ecoregion have been significantly altered since European settlement of the Great Plains. Much of these prairies have been converted to other land uses such as cultivated agriculture, roads, power lines, petroleum production,

wind energy, and transmission lines. Some areas have also been altered due to woody vegetation encroachment. Within this ecoregion, it has been estimated that about 73 percent of the landscape has been converted to cropland with 7 percent of the area in CRP (Dahlgren et al. 2016, p. 262). According to our GIS analysis, of the sources of habitat loss and fragmentation that have occurred, conversion to cropland has had the single largest impact on land cover in this ecoregion (Table 4). Based on our nearest neighbor analysis, we estimated approximately 1,023,894 ac (414,355 ha), or 16 percent of the ecoregion, is potentially available for use by lesser prairie-chicken (Table 1).

TABLE 4.—ESTIMATED AREAS OF CURRENT DIRECT AND INDIRECT IMPACTS, BY IMPACT SOURCE, AND THE PROPORTION OF THE TOTAL AREA OF THE SHORT-GRASS/CRP ECOREGION ESTIMATED TO BE IMPACTED (SEE TABLE 1 FOR TOTALS). (IMPACTS ARE NOT NECESSARILY CUMULATIVE BECAUSE OF OVERLAP OF SOME IMPACTED AREAS BY MORE THAN ONE IMPACT SOURCE.)

Short-Grass/CRP Ecoregion		
Impact Sources	**Acres**	**% of Ecoregion**
Cropland Conversion	2,333,660	37%
Petroleum Production	248,146	4%
Wind Energy Development	145,963	2%
Transmission Lines	436,650	7%
Woody Vegetation Encroachment	284,175	5%
Roads	1,075,931	17%
Total Ecoregion Area	**6,298,014**	

Based on population reconstruction methods, the mean population estimate for this ecoregion increased from a minimum of about 14,000 males in 2001 and peaked at about 21,000 males in 2011 (Hagen et al. 2017, pp. 8–10; see also Service 2021, Figure 3.3).

Aerial surveys since 2012 indicate that the Short-Grass/CRP Ecoregion (Figure 3.4) has the largest population size (Nasman et al. 2020, p. 21) of the four ecoregions. Average estimates from 2015 to 2020 are 16,957 birds (90 percent CI: 13,605, 35,350), making up about 62 percent of the rangewide lesser prairie-chicken total (Table 2).

Much of the Mixed-Grass Ecoregion was originally fragmented by homesteading, which subdivided tracts of land into small parcels of 160–320 ac (65–130 ha) in size (Rodgers 2016, p. 17). As a result of these small parcels, road and fence densities are higher compared to other ecoregions and, therefore, increase habitat fragmentation and pose higher risk for collision mortalities than in other ecoregions (Wolfe et al. 2016, p. 302). Fragmentation has also occurred due to oil and gas development, wind energy development, transmission lines, highways, and expansion of invasive woody plants such as eastern red cedar. A major concern for lesser prairie-chicken populations in this ecoregion is the loss of grassland due to the rapid westward expansion of the eastern red-cedar (NRCS 2016, p. 16). Oklahoma Forestry Services estimated the average rate of expansion of eastern red-cedar in 2002 to be 762 ac (308 ha) per day (Wolfe et al. 2016, p. 302).

TABLE 5.—ESTIMATED AREAS OF CURRENT DIRECT AND INDIRECT IMPACTS, BY IMPACT SOURCE, AND THE PROPORTION (%) OF THE TOTAL AREA OF THE MIXED-GRASS ECOREGION ESTIMATED TO BE IMPACTED (SEE TABLE 1 FOR TOTALS). (IMPACTS ARE NOT NECESSARILY CUMULATIVE BECAUSE OF OVERLAP OF SOME IMPACTED AREAS BY MORE THAN ONE IMPACT SOURCE.)

Mixed-Grass Ecoregion		
Impact Sources	**Acres**	**% of Ecoregion**
Cropland Conversion	1,094,688	13%
Petroleum Production	859,929	10%
Wind Energy Development	191,571	2%
Transmission Lines	576,713	7%
Woody Vegetation Encroachment	2,047,510	24%
Roads	1,732,050	20%
Total Ecoregion Area	**8,527,718**	

Using our geospatial analysis, we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the lesser prairie-chicken. Of the sources of habitat loss and fragmentation that have occurred, encroachment of woody vegetation had the largest impact, with conversion to cropland, roads, and petroleum production also having significant impacts on land cover in this

ecoregion (Table 5). Based on our nearest neighbor analysis, we estimated there are approximately 994,483 ac (402,453 ha) or 12 percent of the ecoregion, that is potentially available for use by lesser prairie-chicken (Table 1).

The Mixed-Grass Ecoregion historically contained the highest lesser prairie-chicken densities (Wolfe et al. 2016, p. 299). Based on population reconstruction methods, the mean population estimate for this ecoregion in the 1970s and 1980s was around 30,000 males (Hagen et al. 2017, pp. 6–7). Population estimates declined in the 1990s and peaked again in the early 2000s at around 25,000 males, before declining and remaining at its lowest levels, <10,000 males in 2012, since the late 2000s (Hagen et al. 2017, pp. 6–7).

Aerial surveys from 2012 through 2020 (Service 2021, Figure 3.6) indicate this ecoregion has the second highest population size of the four ecoregions (Nasman et al. 2020, p. 21). Average estimates from 2015 to 2020 are 6,135 birds (90 percent CI: 1,719, 11,847), representing about 22 percent of the rangewide total (Table 2). Results show minimal variation in recent years.

Prairies of the Sand Sagebrush Ecoregion have been influenced by a variety of activities since European settlement of the Great Plains. Much of these grasslands have been converted to other land uses such as cultivated agriculture, roads, power lines, petroleum production, wind energy, and transmission lines. Some areas have also been altered due to woody vegetation encroachment. Only 26 percent of historical sand sagebrush prairie is available as potential nesting habitat for lesser prairie-chicken (Haukos et al. 2016, p. 285). Using our geospatial analysis, we were able to explicitly account for habitat loss and fragmentation and quantify the current condition of this ecoregion for the lesser prairie-chicken. Of the sources of habitat loss and fragmentation that have occurred, conversion to cropland has had the single largest impact on land cover in this ecoregion (Table 6). Based on our nearest neighbor analysis, we estimated

there are approximately 1,028,523 ac (416,228 ha) or 33 percent of the ecoregion, potentially available for use by lesser prairie-chicken (Table 1). In addition, habitat loss due to the degradation of the rangeland within this ecoregion continues to be a limiting factor for lesser prairie-chicken, and most of the existing birds within this ecoregion persist primarily on and near CRP lands. Drought conditions in the period 2011–2014 have expedited population decline (Haukos et al. 2016, p. 285).

TABLE 6.—ESTIMATED AREAS OF CURRENT DIRECT AND INDIRECT IMPACTS, BY IMPACT SOURCE, AND THE PROPORTION (%) OF THE TOTAL AREA OF THE SAND SAGEBRUSH ECOREGION ESTIMATED TO BE IMPACTED (SEE TABLE 1 FOR TOTALS). (IMPACTS ARE NOT NECESSARILY CUMULATIVE BECAUSE OF OVERLAP OF SOME IMPACTED AREAS BY MORE THAN ONE IMPACT SOURCE.)

Sand Sagebrush Ecoregion		
Impact Sources	**Acres**	**% of Ecoregion**
Cropland Conversion	994,733	32%
Petroleum Production	163,704	5%
Wind Energy Development	0	0%
Transmission Lines	167,240	5%
Woody Vegetation Encroachment	68,147	2%
Roads	446,316	14%
Total Ecoregion Area	**3,153,420**	

Based on population reconstruction methods, the mean population estimate for this ecoregion peaked at >90,000 males from 1970 to 1975 and declined to its lowest level of fewer than 1,000 males in recent years.

Aerial surveys from 2012 through 2020 indicate that this ecoregion has the lowest population size (Nasman et al. 2020, p. 21) of the four ecoregions. Average estimates from 2015 to 2020 are 1,215 birds (90 percent CI: 196, 4,547) representing about 4 percent of the rangewide lesser prairie-chicken total (Table 2). Recent results have been highly variable, with 2020 being the lowest estimate reported. Although the aerial survey results show 171 birds in this ecoregion in 2020, (with no confidence intervals because the number of detections were too low for statistical analysis), ground surveys in this ecoregion in Colorado and Kansas detected 406 birds, so we know the current population

is actually larger than indicated by the aerial survey results (Rossi and Fricke, pers. comm. 2020, entire).

Table 7 combines the estimated area impacted presented above for each of the three ecoregions into one estimate for each impact source for the Northern DPS.

TABLE 7.—ESTIMATED AREAS OF CURRENT DIRECT AND INDIRECT IMPACTS, BY IMPACT SOURCE, AND THE PROPORTION (%) OF THE TOTAL AREA OF THE NORTHERN DPS ESTIMATED TO BE IMPACTED (SEE TABLE 1 FOR TOTALS). (IMPACTS ARE NOT NECESSARILY CUMULATIVE BECAUSE OF OVERLAP OF SOME IMPACTED AREAS BY MORE THAN ONE IMPACT SOURCE.)

Northern DPS		
Impact Sources	**Acres**	**% of DPS**
Cropland Conversion	4,423,081	25%
Petroleum Production	1,271,779	7%
Wind Energy Development	337,534	2%
Transmission Lines	1,180,603	7%
Woody Vegetation Encroachment	2,399,832	13%
Roads	3,254,297	18%
Total Northern DPS Area	**17,979,152**	

Future Condition

As discussed above, we conducted a geospatial analysis to characterize the current condition of the landscape for the lesser prairie-chicken by categorizing land cover data (into potential usable, potential restoration, or non-usable categories), taking into account exclusion areas and impacts to remove non-usable areas. We further refined the analysis to account for connectivity by use of our nearest neighbor analysis as described in *Rangewide Trends*. We then used this geospatial framework to analyze the future condition for each ecoregion. To analyze future habitat changes, we accounted for the effects of both future loss of usable areas and restoration efforts by estimating the rate of change based on future projections (Service 2021, Figure 4.1).

Due to uncertainties associated with both future conservation efforts and impacts, it is not possible to precisely quantify the effect of these future actions on the landscape. Instead, we established five future scenarios to represent a range of plausible outcomes

based upon three plausible levels of conservation (restoration efforts) and three plausible levels of impacts. To account for some of the uncertainty in these projections, we combined the levels of impacts into five different scenarios labeled 1 through 5 (Table 8). Scenario 1 represents the scenario with low levels of future impacts and high levels of future restoration, and Scenario 5 represents the scenario with high impacts and low restoration. Scenario 1 and 5 were used to frame the range of projected outcomes used in our model as they represent the low and high of likely projected outcomes. Scenarios 2, 3, and 4 are model iterations that fall within the range bounded by scenarios 1 and 5 and have continuation of the current level of restoration efforts and vary impacts at low, mid, and high levels, respectively. These scenarios provide a wide range of potential future outcomes to consider in assessing lesser prairie-chicken habitat conditions.

TABLE 8.—SCHEMATIC OF FUTURE SCENARIOS FOR LESSER PRAIRIE-CHICKEN CONSERVATION CONSIDERING A RANGE OF FUTURE IMPACTS AND RESTORATION EFFORTS.

Scenario	**Levels of Future Change in Usable Area**	
	Restoration	Impacts
1	High	Low
2	Continuation	Low
3	Continuation	Mid
4	Continuation	High
5	Low	High

To project the likely future effects of impacts and conservation efforts to the landscape as described through our land cover model, we quantified the three levels of future habitat restoration and three levels of future impacts within the analysis area by ecoregion on an annual basis. In addition to restoration efforts, we also quantified those efforts that enhance existing habitat. While these enhancement efforts do not increase the amount of available area and thus are not included in the spatial analysis, they are summarized in the SSA report and considered as part of the overall analysis of the biological status of the species. We then extrapolated those results over the next 25 years. We chose 25 years as a period for which we had reasonable confidence in reliably

projecting these future changes, and the timeframe corresponds with some of the long-term planning for the lesser prairie-chicken. A complete description of methodology used to quantify projections of impacts and future conservation efforts is provided in the SSA report (Service 2021, Appendix C).

Quantifying future conservation efforts in terms of habitat restoration allows us to account for the positive impact of those efforts within our analysis by converting areas of land cover that were identified as potential habitat in our current condition model to usable land cover for the lesser prairie-chicken in the future projections. Explicitly quantifying three levels of impacts in the future allows us to account for the effect of these impacts on the lesser prairie-chicken by converting areas identified as usable land cover in our current condition model to nonusable area that will not be available for use by the lesser prairie-chicken in the future.

As we did for the current condition to assess habitat connectivity, after we characterized the projected effects of conservation and impacts on potential future usable areas, we grouped the areas of potential usable, unimpacted land cover on these new future landscape projections using our nearest neighbor analysis (Service 2021, pp. 21–24; Appendix B, Parts 1, 2, and 3). Also, as done for the current condition, we evaluated the frequency of usable area blocks by size in order to evaluate habitat fragmentation and connectivity in the future scenarios (Service 2021, Figure 4.2).

Threats Influencing Future Condition

Following are summary evaluations of the expected future condition of threats analyzed in the SSA for the lesser prairie-chicken: effects associated with habitat degradation, loss, and fragmentation, including conversion of grassland to cropland (Factor A), petroleum production (Factor A), wind energy development and transmission (Factor A), woody vegetation encroachment (Factor A), and roads and electrical distribution lines (Factor A); climate change (Factor A); and other factors, such as

livestock grazing (Factor A), shrub control and eradication (Factor A), fire (Factor A); and climate change (Factor E).

In this proposed rule, we do not present summary evaluations of the following threats as we have no information to project future trends, though we do expect them to have some effect on the species in the future: predation (Factor C), collision mortality from fences (Factor E), and influence of anthropogenic noise (Factor E). We also do not discuss the following threats, as they are having little to no impact on the species and its habitat currently, nor do we expect them to into the foreseeable future: hunting and other recreational, educational, and scientific use (Factor B); parasites and diseases (Factor C); and insecticides (Factor E).

For the purposes of this assessment, we consider the foreseeable future to be the amount of time on which we can reasonably determine a likely threat's anticipated trajectory and the anticipated response of the species to those threats. For climate change, the time for which we can reliably project threats and the anticipated response is approximately 60 years. For many other threats impacting the lesser prairie-chicken throughout its range, we consider the time for which we can reliably project threats and the anticipated response to be 25 years. This time period represents our best professional judgment of the foreseeable future conditions related to conversion of grassland to cropland, petroleum production, wind energy, and woody vegetation encroachment, and, as discussed above, is the time period used to project these threats in our geospatial analysis. For this period, we had reasonable confidence in projecting these future changes, and the timeframe corresponds with some of the long-term planning for the lesser prairie-chicken. For other threats and the anticipated species response, we can reliably project impacts and the species response for less than 25 years, such as livestock grazing, roads and electrical distribution lines, shrub control and eradication, and fire.

Habitat Loss and Fragmentation

As discussed in "Threats Influencing Current Condition," habitat loss and fragmentation is the primary concern for lesser prairie-chicken viability. We discuss how each of these activities may contribute to future habitat loss and fragmentation for the lesser prairie-chicken and present the outcomes of the projections.

Conversion of Grassland to Cropland

Because much of the lands capable of being used for row crops has already been converted to cultivated agriculture, we do not expect future rates of conversion to reach those witnessed historically; however, conversion has continued to occur (Lark 2020, entire). Rates of future conversion of grasslands to cultivated agriculture in the analysis area will be affected by multiple variables including site-specific biotic and abiotic conditions as well as socioeconomic influences such as governmental agriculture programs, commodity prices, and the economic benefits of alternative land use practices.

For the purposes of the SSA, we conducted an analysis to project the future rates of conversion of grassland to cropland at three different levels. We used information from aggregated remote sensing data from the USDA Cropland Data layer (Lark 2020, entire; Service 2021, p. 83). Table 9 outlines the resulting three levels of projected habitat loss of future conversion of grassland to cultivated agriculture per ecoregion over the next 25 years. See the SSA report (Service 2021, Appendix C) for further details and methodologies for these projections. While we do not expect future rates of conversion (from grassland to cropland) to be equivalent to those we have historically witnessed, the limited amount of large intact grasslands due to the historical extent of conversion means all future impacts are expected to have a disproportionate scale of impact.

TABLE 9.—FUTURE PROJECTION OF THREE LEVELS OF IMPACTED ACRES OF POTENTIAL USABLE AREA FOR THE LESSER PRAIRIE-CHICKEN FROM CONVERSION OF GRASSLAND TO CROPLAND OVER THE NEXT 25 YEARS IN EACH ECOREGION. (NUMBERS MAY NOT SUM DUE TO ROUNDING.)

Ecoregion	Projected Impacts (acres)		
	Low	Intermediate	High

Short-Grass/CRP	89,675	145,940	185,418
Mixed-Grass	4,220	33,761	50,910
Sand Sagebrush	42,573	95,678	142,438
Northern DPS totals	**136,468**	**275,379**	**378,766**
Shinnery Oak (Southern DPS)	**21,985**	**51,410**	**93,946**
Rangewide Total	**158,454**	**326,789**	**472,712**

Petroleum Production

In the SSA report, we conducted an analysis to project the future rates of petroleum production at low, intermediate, and high levels. We compiled State well permitting spatial data from each State within each of the ecoregions to inform assumptions around future rates of development (Service 2021, p. 84). We converted the projected number of new wells at the three levels to acres of usable area impacted. Our analysis accounts for indirect impacts as well as potential overlap with other existing impacts to include colocation efforts by developers. Table 10 represents the extent of potential usable area impacted at the three levels of development per ecoregion over the next 25 years. See the SSA report (Service 2021, Appendix C) for further details and methodologies regarding these projections.

Given current trends in energy production, we anticipate that oil and gas production across the lesser prairie-chicken range will continue to occur and that rates will vary both temporally and spatially. The rates of development will be dependent upon new exploration, advancements in technology, and socioeconomic dynamics that will influence energy markets in the future.

TABLE 10.—FUTURE PROJECTION OF THREE LEVELS OF IMPACTED ACRES (INCLUDING BOTH DIRECT AND INDIRECT EFFECTS) OF POTENTIAL USABLE AREA FOR THE LESSER PRAIRIE-CHICKEN FROM OIL AND GAS DEVELOPMENT OVER THE NEXT 25 YEARS IN EACH ECOREGION. (NUMBERS MAY NOT SUM DUE TO ROUNDING.)

	Projected Impacts (acres)		
Ecoregion	**Low**	**Intermediate**	**High**
Short-Grass/CRP	26,848	54,618	82,388
Mixed-Grass	82,716	170,989	259,262
Sand Sagebrush	3,166	9,054	14,942

Northern DPS totals	**112,730**	**234,661**	**356,592**
Shinnery Oak (Southern DPS)	**136,539**	**190,144**	**243,749**
Rangewide Total	**249,269**	**424,805**	**600,342**

Wind Energy Development and Transmission Lines

As discussed in "Threats Influencing Current Condition," the States in the lesser prairie-chicken analysis area have experienced some of the largest growth in wind energy development in the nation. Identification of the actual number of proposed wind energy projects that will be built within the range of the lesser prairie-chicken in any future timeframe is difficult to accurately discern. We conducted an analysis of current and potential future wind energy development for the SSA for the Lesser Prairie-Chicken, and the future development was estimated at three different levels within the analysis area of the lesser prairie-chicken at low, intermediate, and high levels (Service 2021, Appendix C). Table 11 represents the wind development projects projected at three levels of development per ecoregion.

TABLE 11.—PROJECTIONS OF FUTURE WIND ENERGY DEVELOPMENT PROJECTS FOR THE NEXT 25 YEARS AT THREE LEVELS IN EACH LESSER PRAIRIE-CHICKEN ECOREGION AND RANGEWIDE.

Ecoregion	Projected Wind Developments		
	Low	**Intermediate**	**High**
Short-Grass/CRP	7	11	16
Mixed-Grass	10	18	25
Sand Sagebrush	1	2	3
Northern DPS totals	**18**	**31**	**44**
Shinnery Oak (Southern DPS)	**4**	**7**	**10**
Rangewide Total	**22**	**38**	**54**

As outlined within "Threats Influencing Current Condition," wind energy development also has indirect impacts on the lesser prairie-chicken. To determine the number of acres impacted by wind energy development in the current condition, we analyzed wind energy facilities recently constructed within and near our analysis area.

We applied a 5,900-ft (1,800-m) impact radius to individual turbines to account for indirect impacts and found that the last 5 years show a substantial increase in the relative density of wind energy projects (see Service 2021, Appendix C, for further details). This analysis does not mean that all of the impacts occur to otherwise usable lesser prairie-chicken land cover. In fact, it is highly unlikely due to viable wind development potential outside lesser prairie-chicken usable areas that all projected impacts will occur in areas that are otherwise usable for the lesser prairie-chicken. Because we cannot predict the precise location of future developments and to simplify and facilitate modeling the locations for future projections for wind development, we created a potential wind energy development grid that was laid over the analysis area and which allowed the random placement for each development for each iteration (Service 2021, p. 86). The resulting projected impacts in 25 years using the median iteration for each of the range of future scenarios are shown in Table 12. Scenarios 1 and 5 were used to frame the scenarios used in our model as they represent the low and high of likely projected outcomes. The rangewide projections range from 164,100 ac (66,400 ha) to 328,000 ac (133,000 ha).

TABLE 12.—RANGE OF PROJECTIONS OF FUTURE WIND ENERGY DEVELOPMENT IMPACTS (INCLUDING BOTH DIRECT AND INDIRECT EFFECTS) IN ACRES FOR THE NEXT 25 YEARS FOR SCENARIOS 1 AND 5 OF EACH LESSER PRAIRIE-CHICKEN ECOREGION AND RANGEWIDE.

Ecoregion	Projected Wind Development Impacts (acres)	
	Scenario 1	Scenario 5
Short-Grass/CRP	68,300	134,200
Mixed-Grass	50,200	106,000
Sand Sagebrush	3,900	21,300
Northern DPS totals	**122,400**	**261,500**
Shinnery Oak (Southern DPS)	**41,700**	**66,500**
Rangewide Total	**164,100**	**328,000**

Electrical transmission capacity represents a major limitation on wind energy development in the Great Plains. Additional transmission lines will be required to transport future electricity production to markets; thus, we expect an expansion of the

current transmission capacity in the Great Plains. As this expansion occurs, these transmission lines will, depending on their location, result in habitat loss as well as further fragmentation and could also be the catalyst for additional wind development affecting the lesser prairie-chicken. While we were able to analyze the current impacts of transmission lines on the lesser prairie-chicken, due to the lack of information available to project the location (and thus effects to lesser prairie-chicken habitat), we could not quantify the future potential effect of habitat loss and fragmentation on the lesser prairie-chicken that could be caused by transmission line development. However, we do acknowledge potential habitat loss and fragmentation from transmission lines is likely to continue depending upon their location.

Woody Vegetation Encroachment

Due to the past encroachment trends and continued suppression of fire across the range of the lesser prairie-chicken, we expect this encroachment of woody vegetation into grasslands to continue, which will result in further loss of lesser prairie-chicken habitat into the foreseeable future. The degree of future habitat impacts will depend on land management practices and the level of conservation efforts for woody vegetation removal.

To describe the potential future effects of encroachment of woody vegetation, we used available information regarding rates of increases in eastern red cedar and mesquite encroachment and applied this rate of change (over the next 25 years) to the amount of existing woody vegetation per ecoregion within the analysis area (Appendix C). The estimated current condition analysis described in "Threats Influencing Current Condition" provides the baseline of woody vegetation encroachment, and rates derived from the literature were applied to this baseline to project new acres of encroachment. We then adjusted the projected number of new acres of encroachment using relative density calculations specific to each ecoregion to account for indirect effects.

Additionally, due to assumed differences in encroachment rates and tree densities we provide two projections for each of the Short-Grass/CRP and Mixed-Grass Ecoregions (East and West portions) in the Northern DPS, largely based on current tree distribution and precipitation gradient. We projected the extent of expected habitat loss due to encroachment of woody vegetation at low, intermediate, and high levels of encroachment (see the SSA report (Service 2021, Appendix C) for rationale behind assumed rates of change). Table 13 outlines the three levels of this projected habitat loss by ecoregion caused by future encroachment of woody vegetation over the next 25 years for the purpose of the SSA report.

TABLE 13.—PROJECTION OF IMPACTS FROM WOODY VEGETATION ENCROACHMENT (INCLUDING BOTH DIRECT AND INDIRECT EFFECTS) AT THREE LEVELS AT YEAR 25 IN THE LESSER PRAIRIE-CHICKEN ECOREGIONS. (NUMBERS MAY NOT SUM DUE TO ROUNDING.)

Ecoregion	Projected Impacts (acres)		
	Low	**Intermediate**	**High**
Short-Grass/CRP – East	38,830	64,489	93,877
Short-Grass/CRP – West	1,390	3,598	5,963
Mixed-Grass – East	311,768	517,784	753,739
Mixed-Grass – West	874	2,261	3,748
Sand Sagebrush	7,650	12,706	18,496
Northern DPS totals	**360,512**	**600,838**	**875,823**
Shinnery Oak (Southern DPS)	**11,548**	**81,660**	**170,653**
Rangewide Total	**372,060**	**682,498**	**1,046,476**

Roads and Electrical Distribution Lines

Roads and electrical distribution lines are another important source of habitat loss and fragmentation. In our geospatial analysis for the current condition of the lesser prairie-chicken, we were able to quantify the area affected by roads, but no data were available to quantify the potential independent impacts of distribution lines on habitat loss and fragmentation. We acknowledge that some additional habitat loss and fragmentation will occur in the future due to construction of new roads and power lines,

but we do not have data available to inform projections on how much and where any potential new development would occur.

Climate Change

Future climate projections for this region of the United States indicate general trends of increasing temperatures and increasing precipitation extremes over the 21st century (Karl et al. 2009, pp. 123–128; Kunkel et al. 2013, pp. 73–75; Shafer et al. 2014, pp. 442–445; Easterling et al. 2017, pp. 216–222; Vose et al. 2017, pp. 194–199). Average temperature has already increased between the first half of the last century (1901–1960) and present day (1986–2016), with observed regional average temperatures within the Southern Great Plains (including Kansas, Oklahoma, and Texas) increasing by 0.8 °F (0.4 °C) and within the Southwest (including Colorado and New Mexico) increasing by 1.6 °F (0.9 °C) (Vose et al. 2017, p. 187). By mid-century (2036–2065), regional average temperatures compared to near-present times (1976–2005) are projected to increase by 3.6–4.6 °F (2.0–2.6 °C) in the Southern Great Plains, and by 3.7–4.8 °F (2.1–2.7 °C) in the Southwest, depending on future emissions. By late-century (2071–2100), regional average temperatures are projected to rise in the Southern Great Plans by 4.8–8.4 °F (2.7–4.7 °C), and by 4.9–8.7 °F (2.7–4.8 °C) in the Southwest (Vose et al. 2017, p. 197). Annual extreme temperatures are also consistently projected to rise faster than annual averages with future changes in very rare extremes increasing; by late century, current 1-in-20 year maximums are projected to occur every year, while current 1-in-20 year minimums are not expected to occur at all (Vose et al. 2017, pp. 197–198).

Projecting patterns of changes in average precipitation across these regions of the United States results in a range of increasing and decreasing precipitation with high uncertainty in overall averages, although parts of the Southwest are projected to receive less precipitation in the winter and spring (Easterling et al. 2017, pp. 216–218; Wuebbles et al. 2017, p. 12). However, extreme precipitation events are projected to increase in

frequency in both the Southern Great Plains and the Southwest (Easterling et al. 2017, pp. 218–221). Other extreme weather events such as heat waves and long duration droughts (Cook et al. 2016, entire), as well as heavy precipitation, are expected to become more frequent (Karl et al. 2009, pp. 124–125; Shafer et al. 2014, p. 445; Walsh et al. 2014, pp. 28–40). The devastating 'dust bowl' conditions of the 1930s could become more common in the American Southwest, with future droughts being much more extreme than most droughts on record (Seager et al. 2007, pp. 1181, 1183–1184). Other modeling also projects changes in precipitation in North America through the end of this century, including an increase in dry conditions throughout the Central Great Plains (Swain and Hayhoe 2015, entire). Furthermore, the combination of increasing temperature and drought results in greater impacts on various ecological conditions (water availability, soil moisture) than increases in temperature or drought alone (Luo et al. 2017, entire). Additionally, future decreases in surface (top 4 inches (10 centimeters)) soil moisture over most of the United States are likely as the climate warms under higher scenarios (Wehner et al. 2017, p. 231).

Grasslands are critically endangered globally and an irreplaceable ecoregion in North America, and climate change is an emerging threat to grassland birds (Wilsey et al. 2019). In a review of potential effects of ongoing climate change on the Southern Great Plains and on the lesser prairie-chicken, results suggest increases in temperatures throughout the lesser prairie-chicken range and possible increases in average precipitation in the northern part of the range but decreasing precipitation in the southern portion of its range (Grisham et al. 2016b, pp. 222–227). Weather changes associated with climate change can have direct effects on the lesser prairie-chicken, leading to reduced survival of eggs, chicks, or adults, and indirect effects on lesser prairie-chicken are likely to occur through a variety of means including long-term (by mid and late twenty-first century) changes in grassland habitat. Other indirect effects may include more secondary causes

such as increases in predation pressure or susceptibility to parasites or diseases. We have little information to describe future grassland conditions as a result of long-term climate changes, although warmer and drier conditions would most likely reduce overall habitat quality for lesser prairie-chicken in much of its range. In general, the vulnerability of lesser prairie-chicken to the effects of climate change depends on the degree to which it is susceptible to, and unable to cope with, adverse environmental changes due to long-term weather trends and more extreme weather events. Based on an analysis of future climate projections the lesser prairie-chicken could have a net loss of more than 35 percent to 50 percent of its range due to unsuitable climate variables (Salas et al. 2017, p. 370).

One area of particular vulnerability for the lesser prairie-chicken is the need for specific thermal profiles in the microhabitats they use for nesting and rearing of broods. Warmer air and surface soil temperatures and the related decreased soil moisture near nest sites have been correlated with lower survival and recruitment in the lesser prairie-chicken (Bell 2005, pp. 16, 21). On average, lesser prairie-chicken avoid sites for nesting that are hotter, drier, and more exposed to the wind (Patten et al. 2005, p. 1275). Nest survival probability decreased by 10 percent every half-hour when temperature was greater than 93.2 °F (34 °C) and vapor pressure deficit was less than -23 mmHg during the day (Grisham et al. 2016c, p. 737). Thermal profiles from nests in some cases exceeded 130 °F (54.4 °C) with humidity below 10 percent at nests in Texas and New Mexico in 2011, which are beyond the threshold for nest survival (Grisham et al. 2013, p. 8). Increased temperatures in the late spring as projected by climate models may lead to egg death or nest abandonment of lesser prairie-chicken (Boal et al. 2010, p. 4). Furthermore, if lesser prairie-chicken shift timing of reproduction (to later in the year) to compensate for lower precipitation, then impacts from higher summer temperatures could be exacerbated. In a study of greater prairie-chickens, heterogeneous grasslands have high thermal variability with a range of measured operative temperatures spanning 41 °F

(23 °C) with air temperatures >86 °F (30 °C) (Hovick et al. 2014b, pp. 1–5). In this setting, females selected nest sites that were as much as 14.4 °F (8 °C) cooler than the surrounding landscape.

Although the entire lesser prairie-chicken range is likely to experience effects from ongoing climate change, the southern part of the Southern DPS (the Shinnery Oak Ecoregion) may be particularly vulnerable to warming and drying weather trends, as this portion of the range is already warmer and drier than northern portions and is projected to continue that trend (Grisham et al. 2013, entire; Grisham et al. 2016c, p. 742). Research in the Shinnery Oak Ecoregion relating projections in weather parameters in 2050 and 2080 to nest survival found with high certainty that the negative effects on future nest survival estimates will be significant, and the resulting survival rates are too low for population sustainability in the Southern Great Plains in the absence of other offsetting influences (Grisham et al. 2013, pp. 6–7). As late spring and summer daily high temperatures rise, the ability for lesser prairie-chicken to find appropriate nest sites and successfully rear broods is expected to decline. Lower rates of successful reproduction and recruitment lead to further overall declines in population abundance and resiliency to withstand stochastic events such as extreme weather events.

Extreme weather effects such as drought, heat waves, and storms can also directly affect lesser prairie-chicken survival and reproduction and can result in population crashes due to species responses including direct mortality from thermal stress, increased predation due to larger foraging areas, or decreased fitness when food resources are scarce. Like other wildlife species in arid and semiarid grasslands, lesser prairie-chicken on the Southern High Plains have adaptations that increase resilience to extreme environments and fluctuating weather patterns; however, environmental conditions expected from climate change may be outside of their adaptive potential, particularly in the timeframe weather changes are expected to occur (Fritts et al. 2018, p. 9556).

Extreme weather events and periods of drying of soil surface moisture are projected to increase across the lesser prairie-chicken range (Easterling et al. 2017, pp. 218–222; Wehner et al. 2017, pp. 237–239). In Kansas, extreme drought events in the summers from 1981 through 2014 had a significant impact on lesser prairie-chicken abundance recorded at leks; thus, increases in drought frequency and intensity could have negative consequences for the lesser prairie-chicken (Ross et al. 2016a, pp. 6–7). Even mild increases in drought had significant impacts on the likelihood of population extirpation for lesser prairie-chicken (De Angelis 2017, p. 15).

Drought is a particularly important factor in considering lesser prairie-chicken population changes. The lesser prairie-chicken is considered a "boom–bust" species, meaning that there is a high degree of annual variation in population size due to variation in rates of successful reproduction and recruitment. These variations are largely driven by seasonal precipitation patterns (Grisham et al. 2013, pp. 6–7). Periods of below-normal precipitation and higher spring/summer temperatures result in less appropriate grassland vegetation cover and fewer food sources, resulting in decreased reproductive output (bust periods). Periods with favorable climatic conditions (above-normal precipitation and cooler spring/summer temperatures) will support favorable lesser prairie-chicken habitat conditions and result in high reproductive success (boom periods). The lesser prairie-chicken population failed to rebound for at least 4 years following the 2011 drought (Fritts et al. 2018, pp. 9556–9557). This information indicates either that the extreme environmental conditions during 2011 may have been beyond what the lesser prairie-chicken is adapted to or that the return period following the 2008–2009 dry period and ensuing low population numbers in 2010 was too short for the population to recover enough to be resilient to the 2011 drought.

The resilience and resistance of species and ecosystems to changing environmental conditions depend on many circumstances (Fritts et al. 2018, entire). As

climatic conditions shift to more frequent and intense drought cycles, this shift is expected to result in more frequent and extreme bust years for the lesser prairie-chicken and fewer boom years. As the frequency and intensity of droughts increase in the Southern Great Plains region, there will be diminishing opportunity for boom years with above-average precipitation. Overall, more frequent and intense droughts may lessen the intensity of boom years of the lesser prairie-chicken population cycle in the future which would limit the ability of the species to rebound following years of drought (Ross et al. 2018, entire). These changes will reduce the overall resiliency of lesser prairie-chicken populations and exacerbate the effects of habitat loss and fragmentation. Because lesser prairie-chicken carrying capacities have already been much reduced, if isolated populations are extirpated due to seasonal weather conditions, they cannot be repopulated due to the lack of nearby populations.

Although climate change is expected to alter the vegetation community across the lesser prairie-chicken range (Grisham et al. 2016b, pp. 228–231), we did not account for the future effects of climate change in our geospatial habitat model, as we did not have information to inform specific land cover changes predicted to result from future climate change (Service 2021, p. 92).

The best available information supports that climate change projections of increased temperatures, increased precipitation extremes, increased soil drying, and an increase of severe events such as drought and storms within the Southern Great Plains are likely to have significant influences on the future resiliency of lesser prairie-chicken populations by mid to late 21st century. These trends are expected to exacerbate the challenges related to past and ongoing habitat loss and fragmentation, making it less likely for populations to withstand extreme weather events that are likely to increase in frequency and severity.

Other Factors

Livestock Grazing

We expect that grazing will continue to be a primary land use on the remaining areas of grassland within the range of the lesser prairie-chicken in the future, and grazing influences habitat suitability for the lesser prairie-chicken (Diffendorfer et al. 2015, p. 1). When managed to produce habitat conditions that are beneficial for the lesser prairie-chicken, grazing is an invaluable tool for maintaining healthy prairie ecosystems. However, if grazing is managed in a way that is focused on maximizing short-term cattle production, resulting in rangeland that is overused, this could have significant negative effects on the lesser prairie-chicken. Grazing management varies both spatially and temporally across the landscape. Additionally, grazing management could become more difficult in the face of a changing climate with more frequent and intense droughts.

Our geospatial model does not account for impacts to habitat quality as data needed to characterize habitat quality for the lesser prairie-chicken at the scale and resolution needed for our analysis do not exist. While data do not exist to quantify rangewide extent of grazing practices and their effects on habitat, livestock grazing will continue to influence lesser prairie-chicken populations in the foreseeable future.

Shrub Control and Eradication

The removal of native shrubs such as sand shinnery oak is an ongoing concern to lesser prairie-chicken habitat availability throughout large portions of its range, particularly in New Mexico, Oklahoma, and Texas. While relatively wide-scale shrub eradication has occurred in the past, we do not have geospatial data to evaluate the extent to which shrub eradication has contributed to habitat loss and fragmentation for the lesser prairie-chicken. While some Federal agencies such as BLM limit this practice in lesser prairie-chicken habitat, shrub control and eradication still occur through some Federal programs and on private lands, which make up the majority of the lesser prairie-chicken range. Though we expect this threat to continue to impact the species into the foreseeable

future, we do not have data available to project the potential scale of habitat loss likely to occur in the future due to shrub eradication.

Fire

As discussed in "Threats Influencing Current Condition," the current lack of prescribed fire use in the range of the lesser prairie-chicken is contributing to woody plant encroachment and degradation of grassland quality.

As the effects of fire suppression continue to manifest throughout the Great Plains, the future impacts of wildfires on the lesser prairie-chicken are difficult to predict. If recent patterns continue with wildfires occurring at increasingly larger scales with less frequency and higher intensities than historical fire occurrence, there is an increasing potential of greater negative impacts on lesser prairie-chicken. Additionally, as climate change projections are indicating the possibility of longer and more severe droughts across the range of the lesser prairie-chicken, this could alter the vegetation response to fire both temporally and spatially. An expansive adoption of prescribed fire in management of remaining grasslands would be expected to have a moderating effect on risk of wildfires and concurrently would reduce woody plant encroachment and increase habitat quality and diversity. We are not able to quantify these impacts on the future condition of the landscape in our geospatial analysis due to lack of data and added complexity, but we acknowledge that fire (both prescribed fires and wildfire), or its absence, will continue to be an ecological driver across the range of the lesser prairie-chicken in the future with potentially positive and negative effects across both short-term and long-term timelines in the foreseeable future.

Projected Future Habitat Conditions and Trends

To forecast the potential changes in future lesser prairie-chicken habitat, we used the projected levels of potential future impacts from conversion to cropland, petroleum production, wind energy development, and woody vegetation encroachment. We also

worked with the primary conservation entities delivering ongoing, established lesser prairie-chicken conservation programs to develop estimated reasonable projections for rates of future conservation efforts. We asked the entities to provide us with information to project three levels of conservation: low, continuation, and high. We asked the conservation entities not provide aspirational goals for a given program but instead to solely use past performance, funding expectations, and expert opinion to provide plausible future rates for given conservation practices. We then used this information to estimate future conservation efforts over the next 25 years for the lesser prairie-chicken.

The results of this future geospatial model (Service 2021, Section 4.2 and Appendices B and C) is provided in Table 14; further details and maps are available in Appendix E of the SSA report. The median results show a very modest increase in areas available for use by lesser prairie-chicken in our nearest neighbor analysis under Scenario 1 (assuming high levels of restoration and low levels of impacts) (with an increase for the Shinnery Oak Ecoregion and a decrease for the other three ecoregions) and decreasing amounts of projected declines in areas available for use by lesser prairie-chicken under Scenarios 2–5 (Table 14). Rangewide changes in areas available for use by lesser prairie-chicken in our nearest neighbor analysis range from a 0.5 percent increase under Scenario 1 to a 26 percent decrease in Scenario 5. This analysis indicated additional future habitat loss and fragmentation across the range of the lesser prairie-chicken is likely to occur, and conservation actions will not be enough to offset those habitat losses. Our analysis finds that the expected conservation efforts are inadequate to prevent continued declines in total habitat availability, much less restore some of what has been lost, and species viability for this species will continue to decline.

TABLE 14.—PROJECTED FUTURE MEDIAN ACREAGE OF LESSER PRAIRIE-CHICKEN AREAS AVAILABLE FOR USE AS A RESULT OF OUR NEIGHBORHOOD ANALYSIS IN ACRES, AND SHOWING PERCENT CHANGE IN ACREAGE FROM ESTIMATED CURRENT AREAS AVAILABLE FOR USE AS A RESULT OF OUR NEIGHBORHOOD ANALYSIS, IN 25 YEARS.

Ecoregion	Total Area	Current Condition	Scenario 1 Low Impacts High Restoration		Scenario 2 Low Impacts Continuation Restoration		Scenario 3 Moderate Impacts Continuation Restoration		Scenario 4 High Impacts Continuation Restoration		Scenario 5 High Impacts Low Restoration	
			Median	% Change	Median	% Change	Median	% Change	Median	% Change	Median	% Change
Short-Grass/CRP	6,298,014	1,023,894	975,047	**-4.8%**	956,190	**-6.6%**	877,663	**-14.3%**	808,152	**-21.1%**	776,111	**-24.2%**
Mixed-Grass	8,527,718	994,483	974,200	**-2.0%**	864,780	**-13.0%**	742,855	**-25.3%**	649,227	**-34.7%**	630,633	**-36.6%**
Sand Sagebrush	3,153,420	1,028,523	992,632	**-3.5%**	980,302	**-4.7%**	932,477	**-9.3%**	887,224	**-13.7%**	884,851	**-14.0%**
Shinnery Oak	3,850,209	1,023,572	1,149,759	**12.3%**	988,072	**-3.5%**	868,761	**-15.1%**	771,923	**-24.6%**	711,933	**-30.4%**
Rangewide Totals	**21,829,361**	**4,070,473**	**4,091,638**	**0.5%**	**3,789,343**	**-6.9%**	**3,421,756**	**-15.9%**	**3,116,525**	**-23.4%**	**3,003,529**	**-26.2%**

It is important to note that these acreages consist of patches of fragmented habitat among developed areas and other unsuitable habitat. Based on our geospatial analysis, the vast majority of blocks of usable habitat and the total area within those blocks, both in the current condition and in future scenarios, are less than 12,000 ac (4,856 ha), and very few blocks were greater than 50,000 ac (20,234 ha) (Service 2021, Figure 4.2). As discussed above, the space required by lesser prairie-chicken to support individuals from a single lek is approximately 12,000–50,000 ac (4,856–20,234 ha). The dominance of smaller blocks on the landscape further exhibits that those spaces are highly fragmented, even with the remaining potential usable area for the lesser prairie-chicken totaling approximately 4,000,000 ac (1,600,000 ha) in the current condition, and potentially declining to as low as 3,000,000 ac (1,200,000 ha) under scenario 5 for our future condition projections. High levels of fragmentation, as discussed in "Threats Influencing Current Condition," do not provide the landscape composition needed for long-term stability of populations. Additionally, in spaces that are highly fragmented, relatively small amounts of additional impacts may have great consequences as landscape composition thresholds for the lesser prairie-chicken are surpassed.

Several habitat enhancement actions for the lesser prairie-chicken are being implemented across the analysis area. These enhancement actions are implemented on existing habitat to enhance the quality of that given area. We asked our conservation partners to provide us with a range of plausible rates for conservation efforts occurring within the lesser prairie-chicken analysis area by ecoregion. We also requested information regarding effectiveness, project lifespan, and spatial targeting of these efforts (Service 2021, Appendix C, Section C.3.4). Next, we converted those rates for each program and conservation effort to the total effort at year 25. Table 15 summarizes the three projected levels of future habitat enhancement over the next 25 years for each ecoregion. These efforts represent those above and beyond what is already accounted for

within the current condition analysis. Acreage enrolled in CCAAs are assumed to continue to be enrolled in the future, and CCAA projections within this table represent enrollments in addition to existing enrollments. This table also does not include continued management actions on permanently protected properties (such as State-owned wildlife management areas or conservation banks), as it is assumed this management will continue. Additionally, the numbers reported for NRCS grazing plans are acres in addition to the number of acres reported above in "Conservation Efforts" that are being managed under prescribed grazing for the lesser prairie-chicken by NRCS, as we assume that as contract acres expire from the program additional acres will be enrolled.

The actual conservation benefit provided to the lesser prairie-chicken by these programs varies greatly and is difficult to summarize because it depends on the location and the specific actions being carried out for each individual agreement. In addition, the level of future voluntary participation in these programs can be highly variable depending on available funding, opportunities for other revenue sources, and many other circumstances.

TABLE 15.—PROJECTED AMOUNT OF HABITAT ENHANCEMENT (IN ACRES) OVER THE NEXT 25 YEARS WITHIN THE FOUR LESSER PRAIRIE-CHICKEN ECOREGIONS.

Enhancement Efforts	Total Level of Future Effort (Acres) at Year 25		
	Low	Continuation	High
Short-Grass/CRP Ecoregion			
KDWPT Enhancement Contract	0	6,740	17,500
NRCS LPCI Grazing Plan	0	0	4,000
USFWS PFW Contract	14,000	14,000	20,000
Mixed-Grass Ecoregion			
WAFWA Management Plan	0	0	118,245
KDWPT Enhancement Contract	0	120	3,100
ODWC Management	1,400	3,300	6,400
ODWC Additional CCAA Enrollment	0	50,000	100,000
NRCS LPCI Grazing Plan	0	0	58,000
USFWS PFW Contract	50,000	50,000	70,000
TPWD Additional CCAA Enrollment	0	0	550,000
Sand Sagebrush Ecoregion			
KDWPT Enhancement Contract	0	720	4,400
CPW Enhancement Contract	0	12,200	37,900
NRCS LPCI Grazing Plan	0	0	13,000
USFWS PFW Contract	0	6,000	18,000
Shinnery Oak Ecoregion			
WAFWA Management Plan	0	0	8,129
NRCS LPCI Grazing Plan	0	0	39,000
BLM Prescribed Fire	0	25,000	100,000
NM CCAA Prescribed Fire	50,000	100,000	150,000
USFWS PFW Contract	5,000	15,000	50,000
TPWD Additional CCAA Enrollment	0	0	60,000

Future Population Trends

Several estimates of lesser prairie-chicken population growth rates have been based on current conditions for the lesser prairie-chicken, with most derived from demographic matrix models (Fields 2004, pp. 76–83; Hagen et al. 2009, entire; Sullins 2017, entire; Cummings et al. 2017, entire). Most studies project declining lesser prairie-chicken populations; however, the magnitude of actual future declines is unlikely to be as low as some modeling tools indicate (Service 2021, Table 4.10). Most positive population growth calculations were derived from 2014–2016 (Hagen et al. 2017,

Supplemental Information; Service 2021, Table 4.10), where estimates indicated populations have increased. However, we caution that any analysis using growth rates based upon short-term data sets can be problematic as they are very sensitive to the starting and ending points in the estimates. Additionally, these growth rates are accompanied by relatively large margins of error.

Estimates based on aerial surveys over the past 9 years have indicated a rangewide fluctuating population beginning with an estimated 28,366 (90 percent CI: 17,055–40,581) individuals in 2012 to an estimated 34,408 (90 percent CI: 21,270–47,946) individuals in 2020. Included within this timeframe was a population low of 15,397 (90 percent CI: 8,145–22,406) individuals in 2013. We caution against drawing inferences from point estimates based upon these data due to low detection probabilities of the species leading to large confidence intervals. We also caution that trend analyses from short-term data sets are highly sensitive to starting and ending population sizes. For example, if you use 2012, the first year of available rangewide survey data, as the starting point for a trend analysis, it may appear that populations are relatively stable to slightly increasing, but during the years of 2010–2013, the range of the lesser prairie-chicken experienced a severe drought and thus lesser prairie-chicken populations were at historic lows. If the data existed to perform the same analysis using the starting point as 2009, then the results would likely show a decreasing population trend.

The future risk of extinction of the lesser prairie-chicken has been evaluated using historical ground surveys (Garton et al. 2016, pp. 60–73). This analysis used the results of those surveys to project the risk of lesser prairie-chicken quasi-extinction in each of the four ecoregions and rangewide over two timeframes, 30 and 100 years into the future. For this analysis, quasi-extinction was set at effective population sizes (demographic N_e) of 50 (populations at short-term extinction risk) and 500 (populations at long-term extinction risk) adult breeding birds, corresponding to an index based on minimum males

counted at leks of ≤85 and ≤852, respectively (Garton et al. 2016, pp. 59–60). The initial analysis using data collected through 2012 was reported in Garton et al. (2016, pp. 60–73), but it has since been updated to include data collected through 2016 (Hagen et al. 2017, entire). We have identified concerns in the past with some of the methodologies and assumptions made in this analysis, and the challenges of these data are noted in Zavaleta and Haukos (2013, p. 545) and Cummings *et al*. (2017, pp. 29–30). While these concerns remain, this work represents one of the few attempts to project risk to the species across its range, and we considered it as part of our overall analysis and recognize any limitations associated with the analysis.

Results were reported for each analysis assuming each ecoregion is functioning as an independent population and also assuming there is movement of individuals between populations (Service 2021, Table 4.11; Table 4.12). The results suggest a wide range of risks among the ecoregions, but the Sand Sagebrush Ecoregion consistently had the highest risks of quasi-extinction and the Short-Grass/CRP Ecoregion had the lowest. This analysis was based only on simulating demographic variability of populations and did not incorporate changing environmental conditions related to habitat or climate.

Determination of Lesser Prairie-Chicken Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of an endangered species or a threatened species. The Act defines "endangered species" as a species "in danger of extinction throughout all or a significant portion of its range," and "threatened species" as a species "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." The Act requires that we determine whether a species meets the definition of "endangered species" or "threatened species" because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B)

Overutilization for commercial, recreational, scientific, or educational purposes; (C) Disease or predation; (D) The inadequacy of existing regulatory mechanisms; or (E) Other natural or manmade factors affecting its continued existence.

Status of the Southern DPS of the Lesser Prairie-Chicken Throughout All of Its Range

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Southern DPS of the lesser prairie-chicken and its habitat. We analyzed effects associated with habitat degradation, loss, and fragmentation, including conversion of grassland to cropland (Factor A), petroleum production (Factor A), wind energy development and transmission (Factor A), woody vegetation encroachment (Factor A), and roads and electrical distribution lines (Factor A); other factors, such as livestock grazing (Factor A), shrub control and eradication (Factor A), collision mortality from fences (Factor E), predation (Factor C), influence of anthropogenic noise (Factor E), and fire (Factor A); and extreme weather events (Factor E). We also analyzed the effects of existing regulatory mechanisms (Factor D) and ongoing conservation measures. In the SSA report, we also considered three additional threats: hunting and other recreational, educational, and scientific use (Factor B); parasites and diseases (Factor C); and insecticides (Factor E). We consider all of these impacts now in analyzing the status of the Southern DPS.

Over the past several decades, habitat loss, fragmentation, and degradation have resulted in the loss of large areas of the habitat that supports the lesser prairie-chicken in the Southern DPS. Suitable habitat has been lost as grasslands are converted to cropland, and as petroleum and natural gas production and wind energy development have resulted in further loss of habitat. The lesser prairie-chicken is particularly vulnerable to changes on the landscape, as it requires large blocks of suitable habitat to complete its life-history needs. This includes its lek breeding system, which requires males and females to be able to hear and see each other over relatively wide distances, the need for large patches of

habitat that include several types of microhabitats, and the behavioral avoidance of vertical structures. In the case of petroleum and wind energy production, the extent of the impact from the threat is not just the original site, but also all roads, powerlines, and other infrastructure associated with the sites, and noise associated with those areas that may interfere with communication between male and female birds.

In the Southern DPS, woody vegetation encroachment by honey mesquite has played a significant role in limiting available space for the lesser prairie-chicken and is one of the primary threats to the species in this DPS. Fire, incompatible grazing management, and drought associated with climate change also continue to degrade habitat. The size of fires, especially in areas dominated by woody vegetation, are increasing. When managed compatibly, fire and grazing can improve habitat quality. However, fire management efforts are currently occurring on only a limited portion of the lesser prairie-chicken range.

The Southern DPS is particularly vulnerable to effects associated with climate change and drought, as it is already warmer and drier than the Northern DPS. That warmer and drier trend is expected to continue (Grisham et al. 2013, entire; Grisham et al. 2016c, p. 742). Given the needs of lesser prairie-chicken for cool microclimates to find appropriate nest sites and rear broods, droughts like those that have recently occurred on the landscape could further impact already declining population growth rates in this DPS.

Some conservation measures and regulatory mechanisms are acting to reduce the magnitude of threats impacting the lesser prairie-chicken and its habitat. However, our analysis demonstrates that the restoration efforts have not been enough to offset the impacts of habitat loss and fragmentation and conservation efforts focused on localized management to affect habitat quality, while not addressing the overarching limiting factor of habitat loss and fragmentation, is not addressing the long-term population needs for the

lesser prairie-chicken. Thus, these measures are only minimally ameliorating the threats acting throughout the DPS.

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we conclude that the Southern DPS is continuing to experience ongoing habitat loss and fragmentation, and additional threats from influence of anthropogenic noise and extreme weather events, particularly droughts. Currently, only 27 percent of this ecoregion is available for use by the lesser prairie-chicken. Based on mean population estimates, the Southern DPS has very low resiliency to stochastic events. It may have as few as 5,000 birds remaining. The population count dropped to as low as 1,000 birds in 2015 after the last severe drought. Under current climactic conditions, another wide-scale severe drought could occur in this ecoregion at any time, and the species may not be able to recover. Overall, the lesser prairie-chickens in the Southern DPS are likely to continue to experience declines in resiliency, redundancy, and genetic representation. Thus, after assessing the best available information, we determine that the Southern DPS of the lesser prairie-chicken is in danger of extinction throughout all of its range. We find that a threatened species status is not appropriate for the Southern DPS because it is currently in danger of extinction.

Status of the Southern DPS of the Lesser Prairie-Chicken Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. We have determined that the Southern DPS of the lesser prairie-chicken is in danger of extinction throughout all of its range and accordingly did not undertake an analysis of any significant portion of its range. Because the Southern DPS of the lesser prairie-chicken warrants listing as endangered throughout all of its range, our determination is consistent with the decision in *Center for Biological*

Diversity v. *Everson*, 2020 WL 437289 (D.D.C. Jan. 28, 2020), in which the court vacated the aspect of the Final Policy on Interpretation of the Phrase "Significant Portion of Its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species" (79 FR 37578; July 1, 2014) that provided the Services do not undertake an analysis of significant portions of a species' range if the species warrants listing as endangered throughout all of its range.

Determination of Status of the Southern DPS of the Lesser Prairie-Chicken

Our review of the best available scientific and commercial information indicates that the Southern DPS of the lesser prairie-chicken meets the definition of an endangered species. Therefore, we propose to list the Southern DPS of the lesser prairie-chicken as an endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

Status of the Northern DPS of the Lesser Prairie-Chicken Throughout All of Its Range

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the Northern DPS of the lesser prairie-chicken and its habitat. We analyzed effects associated with habitat degradation, loss, and fragmentation, including conversion of grassland to cropland (Factor A), petroleum production (Factor A), wind energy development and transmission (Factor A), woody vegetation encroachment (Factor A), and roads and electrical distribution lines (Factor A); other factors, such as livestock grazing (Factor A), shrub control and eradication (Factor A), collision mortality from fences (Factor E), predation (Factor C), influence of anthropogenic noise (Factor E), and fire (Factor A); and extreme weather events (Factor E). We also analyzed existing regulatory mechanisms (Factor D) and ongoing conservation measures. In the SSA report, we also considered three additional threats: hunting and other recreational, educational, and scientific use (Factor B); parasites and diseases (Factor C); and insecticides (Factor E). As with the Southern DPS, we consider all of these impacts now in analyzing the status of the Northern DPS.

As is the case in the Southern DPS, habitat degradation, loss, and fragmentation is the primary threat to the lesser prairie-chicken in this DPS, with other threats such as fire, incompatible livestock grazing, and extreme weather events further decreasing population resiliency and species redundancy. The largest impacts in this DPS are cropland conversion and woody vegetation encroachment. The Sand Sagebrush Ecoregion is also experiencing habitat degradation due to incompatible grazing management. The Short-Grass/CRP region has the highest number of birds, with a 5-year estimate of approximately 17,000 birds. Other portions of the range have lower population resiliency. In particular, the Sand Sagebrush Ecoregion has approximately 1,000 birds remaining (Table 2).

Resiliency of populations throughout the Northern DPS has decreased from historical levels, though the DPS still has redundancy across the three ecoregions and genetic and environmental representation. However, our future scenario analysis demonstrates that the current threats acting on the landscape are expected to either continue at the same levels or increase in severity in the foreseeable future. Habitat loss is projected to outpace conservation efforts to restore habitat. Though we do not expect rates of habitat conversion to cropland to be equivalent to the rates that we historically witnessed, we expect any additional conversion that does occur will have a disproportionately large effect on resiliency and redundancy due to the limited amount of remaining large intact grasslands. Conversion of habitat due to oil, gas, and wind energy will continue to occur, though the rates of development are uncertain. Woody vegetation encroachment is also expected to continue, particularly in the Mixed-Grass Ecoregion. Increased drought and severe weather events associated with climate change are expected to decrease population resiliency and redundancy into the foreseeable future, and as habitat availability continues to decline, and available habitat blocks decrease in size, populations may decline to below quasi-extinction levels. Our future scenarios project

that usable habitat will decrease from 3–25 percent within the Northern DPS (5–24 percent in the Short-Grass/CRP Ecoregion, from 2–37 percent in the Mixed-Grass Ecoregion, and from 3–14 percent in the Sand Sagebrush Ecoregion) due to projected impacts from conversion to cropland, energy development, and woody vegetation encroachment.

Conservation measures and regulatory mechanisms are acting to reduce the magnitude of threats impacting the lesser prairie-chicken and its habitat. However, our analysis demonstrates that future restoration efforts will not be enough to offset the impacts of habitat loss and fragmentation and conservation efforts focused on localized management to affect habitat quality, while not addressing the overarching limiting factor of habitat loss and fragmentation, is not addressing the long-term population needs for the lesser prairie-chicken. Thus, these measures are having only minimal impacts on threats acting throughout the DPS.

After evaluating threats to the species and assessing the cumulative effect of the threats under the section 4(a)(1) factors, we find that the lesser prairie-chicken maintains populations in all three ecoregions in the Northern DPS, and has genetic and ecological representation in those ecoregions, as well as population redundancy across the entirety of the DPS. Thus, lesser prairie-chicken in the Northern DPS are not currently in danger of extinction, and thus the Northern DPS does not meet the definition of endangered. However, based on our future projections, habitat will become increasingly fragmented and less able to support lesser prairie-chickens. Thus, after assessing the best available information, we conclude that the Northern DPS of the lesser prairie-chicken is not currently in danger of extinction but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

Status of the Northern DPS of the Lesser Prairie-Chicken Throughout a Significant Portion of Its Range

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity* v. *Everson*, 2020 WL 437289 (D.D.C. Jan. 28, 2020) (*Everson*), vacated the aspect of the 2014 Significant Portion of its Range Policy that provided that the Services do not undertake an analysis of significant portions of a species' range if the species warrants listing as threatened throughout all of its range. Therefore, we proceed to evaluating whether the species is endangered in a significant portion of its range—that is, whether there is any portion of the species' range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the "significance" question or the "status" question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species' range.

We apply the term "significant" differently for the purpose of the "significant portion of the range" analysis than the DPS analysis. The DPS Policy requires that for a vertebrate population to meet the Act's definition of "species," the population must be discrete from other populations and must be significant to the taxon as a whole. The use of "significant to the taxon as a whole" under the DPS Policy is necessarily broad. Notably, a segment could be "significant to the taxon as a whole" for the DPS policy but not be "significant" for the different analysis under the Significant Portion of Its Range Policy. Thus, a determination that an area is significant for the purposes of DPS does not necessarily mean that it will be significant for the purposes of the Significant Portion of Its Range Policy.

Following the court's holding in *Center for Biological Diversity*, we now consider

whether there are any significant portions of the species' range where the species is in danger of extinction now (i.e., endangered). In undertaking this analysis for the Northern DPS of the lesser prairie-chicken, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species is endangered. We evaluated all parts of the Northern DPS, including the Sand Sagebrush Ecoregion, the Mixed Grass Ecoregion, and the Short Grass/CRP Ecoregion. We identified one portion, the Sand Sagebrush Ecoregion, that may meet the definition of endangered, as population estimates have shown the greatest declines in that portion of the range.

For the Northern DPS, we considered whether the threats are geographically concentrated in any portion of the species' range at a biologically meaningful scale. We examined the following threats: effects associated with habitat degradation, loss, and fragmentation, including conversion of grassland to cropland, petroleum production, wind energy development and transmission, woody vegetation encroachment, and roads and electrical distribution lines; other factors, such as livestock grazing, shrub control and eradication, collision mortality from fences, predation, influence of anthropogenic noise, and fire; extreme weather events, including cumulative effects. However, we did not identify any threats that were concentrated in the Sand Sagebrush Ecoregion that were not at similar levels in the remainder of the range at a biologically meaningful scale.

Thus, there are no portions of the DPS's range where the species has a different status from its rangewide status. Therefore, no portion of the species' range provides a basis for determining that the species is in danger of extinction in a significant portion of its range, and we determine that the species is likely to become in danger of extinction within the foreseeable future throughout all of its range. This is consistent with the courts' holdings in *Desert Survivors* v. *Department of the Interior*, No. 16-cv-01165-JCS,

2018 WL 4053447 (N.D. Cal. Aug. 24, 2018), and *Center for Biological Diversity* v. *Jewell*, 248 F. Supp. 3d , 946, 959 (D. Ariz. 2017).

Determination of Status of the Northern DPS of the Lesser Prairie-Chicken

Our review of the best available scientific and commercial information indicates that the Northern DPS of the lesser prairie-chicken meets the definition of a threatened species. Therefore, we propose to list the Northern DPS of the lesser prairie-chicken as a threatened species in accordance with sections 3(20) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

Recovery planning consists of preparing draft and final recovery plans, beginning with the development of a recovery outline and making it available to the public within 30 days of a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. The recovery plan also identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened ("downlisting") or removal from protected status ("delisting"), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (*http://www.fws.gov/endangered*), or from our Arlington Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (such as restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their range may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

If this species is listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for

non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the States of Colorado, Kansas, New Mexico, Oklahoma, and Texas would be eligible for Federal funds to implement management actions that promote the protection or recovery of the lesser prairie-chicken. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants*.

Although the Southern DPS and the Northern DPS of the lesser prairie-chicken are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for the lesser prairie-chicken. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as an endangered or threatened species and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

Some examples of Federal agency actions within the species' habitat that may require conference or consultation, or both, as described in the preceding paragraph

include: landscape-altering activities on Federal lands; provision of Federal funds to State and private entities through Service programs, such as the PFW Program, the State Wildlife Grant Program, and the Wildlife Restoration Program; construction and operation of communication, radio, and similar towers by the Federal Communications Commission or Federal Aviation Administration; issuance of section 404 Clean Water Act permits by the U.S. Army Corps of Engineers; construction and management of petroleum pipeline by the Federal Energy Regulatory Commission; construction and maintenance of roads or highways by the Federal Highway Administration; implementation of certain USDA agricultural assistance programs; Federal grant, loan, and insurance programs; or Federal habitat restoration programs such as Environmental Quality Incentive Program and CRP; and development of Federal minerals, such as oil and gas.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect; or to attempt any of these) endangered wildlife within the United States or on the high seas. In addition, it is unlawful to import; export; deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or sell or offer for sale in interstate or foreign commerce any species listed as an endangered species. It is also illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to employees of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits are

codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance the propagation or survival of the species, and for incidental take in connection with otherwise lawful activities. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is our policy, as published in the *Federal Register* on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of the species proposed for listing. For the Northern DPS of the lesser prairie-chicken, which we are proposing to list as threatened, the discussion below in section II regarding protective regulations under section 4(d) of the Act complies with our policy.

We now discuss specific activities related to the Southern DPS, which we are proposing to list as endangered. Based on the best available information, the following actions are unlikely to result in a violation of section 9, if these activities are carried out in accordance with existing regulations and permit requirements; this list is not comprehensive. As identified in the SSA report, restoration actions are essential for conservation of the lesser prairie-chicken. Restoration actions will not constitute a violation of section 9 as those actions are implemented on lands that are not currently lesser prairie-chicken habitat. These restoration actions include:

(1) Planting previously tilled or no till croplands to grasses;

(2) Removal of nonnative or invasive trees and shrubs, not including shinnery oak or sand sagebrush; and

(3) Removal of existing infrastructure including oil and gas infrastructure, electrical transmission and distribution lines, windmills, existing fences, and other anthropogenic features impacting the landscape.

Based on the best available information, the following activities may potentially result in a violation of section 9 of the Act in the southern DPS of the lesser prairie-chicken if they are not authorized in accordance with applicable law; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the species, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Actions that would result in the unauthorized destruction or alteration of the species' habitat. Such activities could include, but are not limited to, the removal of native shrub or herbaceous vegetation by any means for any infrastructure construction project or the direct conversion of native shrub or herbaceous vegetation to another land use.

(3) Actions that would result in sustained alteration of preferred vegetative characteristics of lesser prairie-chicken habitat, particularly those actions that would cause a reduction or loss in the native invertebrate community within those habitats or alterations to vegetative composition and structure. Such activities could include, but are not limited to, incompatible livestock grazing, the application of herbicides or insecticides, and seeding of nonnative plant species that would compete with native vegetation for water, nutrients, and space.

(4) Actions that would result in lesser prairie-chicken avoidance of an area during one or more seasonal periods. Such activities could include, but are not limited to, the construction of vertical structures such as power lines, communication towers, buildings,

infrastructure to support energy development, roads, and other anthropogenic features; motorized and nonmotorized recreational use; and activities such as well drilling, operation, and maintenance, which would entail significant human presence, noise, and infrastructure.

(5) Actions, intentional or otherwise, that would result in the destruction of eggs or active nests or cause mortality or injury to chicks, juveniles, or adult lesser prairie-chickens.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act in regards to the Southern DPS of the lesser prairie-chicken should be directed to the Arlington Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

II. Proposed Rule Issued Under Section 4(d) of the Act for the Northern DPS of the Lesser Prairie-Chicken

Background

Section 4(d) of the Act contains two sentences. The first sentence states that the "Secretary shall issue such regulations as he deems necessary and advisable to provide for the conservation" of species listed as threatened. The U.S. Supreme Court has noted that statutory language like "necessary and advisable" demonstrates a large degree of deference to the agency (see *Webster* v. *Doe*, 486 U.S. 592 (1988)). Conservation is defined in the Act to mean "the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the Act] are no longer necessary." Additionally, the second sentence of section 4(d) of the Act states that the Secretary "may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants." Thus, the combination of the

two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence grants particularly broad discretion to the Service when adopting the prohibitions under section 9.

The courts have recognized the extent of the Secretary's discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld rules developed under section 4(d) as a valid exercise of agency authority where they prohibited take of threatened wildlife, or include a limited taking prohibition (see *Alsea Valley Alliance* v. *Lautenbacher*, 2007 U.S. Dist. Lexis 60203 (D. Or. 2007); *Washington Environmental Council* v. *National Marine Fisheries Service*, 2002 U.S. Dist. Lexis 5432 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana* v. *Verity*, 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, "once an animal is on the threatened list, the Secretary has an almost infinite number of options available to him with regard to the permitted activities for those species. He may, for example, permit taking, but not importation of such species, or he may choose to forbid both taking and importation but allow the transportation of such species" (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

Exercising this authority under section 4(d), we have developed a proposed rule that is designed to address the specific threats and conservation needs of the Northern DPS of the lesser prairie-chicken. Although the statute does not require us to make a "necessary and advisable" finding with respect to the adoption of specific prohibitions under section 9, we find that this rule as a whole satisfies the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the Northern DPS of the lesser prairie-chicken. As discussed above under **Summary of Biological Status and Threats**, we have concluded that the Northern DPS

of the lesser prairie-chicken is likely to become in danger of extinction within the foreseeable future primarily due to threats associated with habitat loss, fragmentation, and degradation. The provisions of this proposed 4(d) rule would promote conservation of the Northern DPS of the lesser prairie-chicken by encouraging management of the landscape in ways that meet the conservation needs of the lesser prairie-chicken and identifying the prohibitions needed to conserve the lesser prairie-chicken. We believe it is appropriate to extend the standard section 9 prohibitions for endangered species to the Northern DPS of the lesser prairie-chicken in order to conserve the species.

While developing this proposed 4(d) rule, the Service considered exceptions to the standard section 9 prohibitions for endangered species that would facilitate essential conservation actions needed for the Northern DPS. We consider essential conservation efforts to include restoration actions, utilization of prescribed fire, and compatible grazing management as the primary essential conservation actions needed to conserve the lesser prairie-chicken.

For the purposes of this rule and our SSA analysis we consider restoration actions to be actions that convert areas that are otherwise not habitat for lesser prairie-chickens to areas which are lesser prairie-chicken habitat. These actions are essential for the species as this is the only way to offset habitat loss and fragmentation. For the lesser prairie-chicken, the primary restoration actions consist of woody vegetation removal in and adjacent to grasslands (this does not include the removal of sand shinnery oak (specifically, *Quercus havardii* species) or sand sagebrush (specifically, *Artemisia filifolia* species)), removal of existing anthropogenic features (such as existing energy infrastructure, roads, fences, windmills, and other anthropogenic features), and converting cropland to grassland. We have determined that an exception under this 4(d) rule is not needed for these restoration actions as they occur on lands already impacted or

altered in ways that they no longer represent lesser prairie-chicken habitat and thus there is no potential for a section 9 violation.

We also considered the value provided by the implementation of prescribed fire on the landscape. Prior to extensive Euro-American settlement, frequent fires helped confine trees like eastern red cedar to river and stream drainages and rocky outcroppings. However, settlement of the Southern Great Plains altered the historical ecological context and disturbance regimes. The frequency and intensity of these disturbances directly influenced the ecological processes, biological diversity, and patchiness typical of Great Plains grassland ecosystems, which evolved with frequent fire that helped to maintain prairie habitat for lesser prairie-chicken (Collins 1992, pp. 2003–2005; Fuhlendorf and Smeins 1999, pp. 732, 737).

Following Euro-American settlement, fire suppression allowed trees, such as eastern red cedar, to begin invading or encroaching upon neighboring grasslands. Implementation of prescribed fire is often the best method to control or preclude tree invasion of grasslands. However, to some landowners and land managers, burning of grassland can be perceived as unnecessary for meeting their management goals, costly and burdensome to enact, undesirable for optimizing production for cattle, and likely to create wind erosion or “blowouts” in sandy soils. Consequently, wildfire suppression is common, and relatively little prescribed burning occurs on private land. Often, prescribed fire is employed only after significant tree invasion has already occurred and landowners consider forage production for cattle to have diminished. Preclusion of woody vegetation encroachment on grasslands of the southern Great Plains using fire requires implementing fire at a frequency that mimics historical fire frequencies of 2–14 years (Guyette et al. 2012, p. 330) and thus further limits the number of landowners implementing fire in a manner that would truly preclude future encroachment. We have determined that there is a potential for short-term adverse impacts, but we want to

encourage the use of prescribed fire on the landscape; thus, we provide an exception for this action below.

Finally, we considered the need for compatibly managed grazing activities that result in the vegetation structure and composition needed to support the lesser prairie-chicken. The habitat needs for the lesser prairie-chicken vary across the range, and grazing can affect these habitats in different ways. It is important that grazing be managed at a given site to account for a variety of factors specific to the local ecological site including past management, soils, precipitation and other factors. This management will ensure that the resulting vegetative composition and structure will support the lesser prairie-chicken. Grazing management that alters the vegetation community to a point where the composition and structure are no longer suitable for lesser prairie-chicken can contribute to habitat loss and fragmentation within the landscape, even though these areas may remain as prairie or grassland. Livestock grazing, however, is not inherently detrimental to the lesser prairie-chicken provided that grazing management results in a plant community with species and structural diversity suitable for the lesser prairie-chicken. When livestock grazing is managed compatibly, it can be an invaluable tool necessary for managing healthy grasslands benefiting the lesser prairie-chicken.

While developing this proposed 4(d) rule, we found that determining how to manage grazing in a manner compatible with the Northern DPS of the lesser prairie chicken is highly site specific based on conditions at the local level; thus, broad determinations within this proposed 4(d) rule would not be beneficial to the species or local land managers. While the 4(d) rule was one approach considered to promote conservation of the Northern DPS of the lesser prairie-chicken by encouraging management of grassland landscapes in ways that support both long-term viability of livestock enterprises, and concurrent conservation of lesser prairie-chicken, we determined that other mechanisms would be more appropriate to support this action.

Besides a 4(d) rule, other mechanisms supporting conservation opportunities exist in other portions of the Endangered Species Act and our policies, including under Federal Agency Actions and Consultations (section 7), Permits (section 10), and Conservation Banking. We recognize the value of compatibly managed grazing for the lesser prairie-chicken, and we look forward to working with our partners and local land managers to ensure there are viable conservation options that provide regulatory coverage for interested landowners.

The provisions of this proposed rule are one of many tools that we would use to promote the conservation of the Northern DPS of the lesser prairie-chicken. This proposed 4(d) rule would apply only if and when we make final the listing of the Northern DPS of the lesser prairie-chicken as a threatened species.

Provisions of the Proposed 4(d) Rule

This proposed 4(d) rule would provide for the conservation of the Northern DPS of the lesser prairie-chicken by prohibiting the following activities, except as otherwise authorized or permitted: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; or selling or offering for sale in interstate or foreign commerce. We also include the following two exceptions to these prohibitions, which along with the prohibitions, are set forth under Proposed Regulation Promulgation:

(1) Continuation of routine agricultural practices on existing cultivated lands.

This proposed 4(d) rule provides that take of the lesser prairie-chicken will not be prohibited provided the take is incidental to activities that are conducted during the continuation of routine agricultural practices, as specified below, on cultivated lands that are in row crop, seed-drilled untilled crop, hay, or forage production. These lands must meet the definition of cropland as defined in 7 CFR 718.2, and, in addition, must have

been cultivated, meaning tilled, planted, or harvested, within the 5 years preceding the proposed routine agricultural practice that may otherwise result in take. Thus, this provision does not include take coverage for any new conversion of grasslands into agriculture.

Lesser prairie-chickens travel from native rangeland and CRP lands, which provide cover types that support lesser prairie-chicken nesting and brood-rearing, to forage within cultivated fields supporting small grains, alfalfa, and hay production. Lesser prairie-chickens also maintain lek sites within these cultivated areas, and they may be present during farming operations. Thus, existing cultivated lands, although not a native habitat type, may provide food resources for lesser prairie-chickens.

Routine agricultural activities covered by this provision include:

(a) Plowing, drilling, disking, mowing, or other mechanical manipulation and management of lands.

(b) Routine activities in direct support of cultivated agriculture, including replacement, upgrades, maintenance, and operation of existing infrastructure such as buildings, irrigation conveyance structures, fences, and roads.

(c) Use of chemicals in direct support of cultivated agriculture when done in accordance with label recommendations.

We do not view regulating these activities as necessary and advisable for the conservation of the lesser prairie-chicken as, while there may be limited use for foraging and lekking sites, these lands do not have the ability to support the complete life-history needs of the species and thus are not considered habitat. We are proposing that none of the provisions in 50 CFR 17.31 would apply to actions that result from activities associated with the continuation of routine agricultural practices, as specified above, on existing cultivated lands that are in row crop, seed-drilled untilled crop, hay, or forage production. These lands must meet the definition of cropland as defined in 7 CFR 718.2,

and, in addition, must have been cultivated, meaning tilled, planted, or harvested, within the previous 5 years.

(2) Implementation of prescribed fire for the purposes of grassland management.

This proposed 4(d) rule provides that take of the lesser prairie-chicken will not be prohibited provided the take is incidental to activities that are conducted during the implementation of prescribed fire, as specified below, for the purpose of grassland and shrubland management.

As discussed in the Background section of this proposed 4(d) rule, fire plays an essential role in maintaining healthy grasslands and shrublands, preventing woody vegetation encroachment, and encouraging the structural and species diversity of the plant community required by the lesser prairie-chicken. The intensity, scale, and frequency of fire regimes in the southern Great Plains has been drastically altered due to human suppression of wildfire resulting in widespread degradation and loss of grasslands. While fire plays an important role, potential exists for some short-term negative impacts to the lesser prairie-chicken while implementing prescribed fire. The potential impacts depend upon what time of the year the fire occurs, extent of habitat burned and burn severity including, but are not limited to, disturbance of individuals, destruction of nests, and impacts to available cover for nesting and concealment from predators.

Prescribed fire activities covered by this provision include:

(a) Construction and maintenance of fuel breaks.

(b) Planning needed for application of prescribed fire.

(c) Implementation of the fire and all associated actions.

(d) Any necessary monitoring and followup actions.

Implementation of prescribed fire is essential to managing for healthy grasslands and shrublands, but currently use of prescribed fire is minimal or restricted to frequent use in small local areas within the range of the lesser prairie-chicken. While prescribed fire has

the potential for some limited negative short-term effects on the lesser prairie-chicken, we have concluded that the long-term benefits of implementing prescribed fire drastically outweigh the short-term negative effects. Furthermore, as discussed in the background section of this proposed 4(d) rule, fire is a necessary component for the management and maintenance of healthy grassland for the lesser prairie-chicken. We are proposing that none of the provisions in 50 CFR 17.31 would apply to the implementation of prescribed fire as discussed above.

As discussed above under **Summary of Biological Status and Threats**, threats including habitat loss, fragmentation, and degradation are affecting the status of the Northern DPS of the lesser prairie-chicken. A range of activities have the potential to affect the Northern DPS of the lesser prairie-chicken, including actions that would result in the unauthorized destruction or alteration of the species' habitat. Such activities could include, but are not limited to: the removal of native shrub or herbaceous vegetation by any means for any infrastructure construction project or direct conversion of native shrub or herbaceous vegetation to another land use; actions that would result in the long-term alteration of preferred vegetative characteristics of lesser prairie-chicken habitat, particularly those actions that would cause a reduction or loss in the native invertebrate community within those habitats.

Such activities could include, but are not limited to, incompatible livestock grazing, the application of herbicides or insecticides, and seeding of nonnative plant species that would compete with native vegetation for water, nutrients, and space; and actions that would result in lesser prairie-chicken avoidance of an area during one or more seasonal periods. Such activities could include, but are not limited to, the construction of vertical structures such as power lines, communication towers, buildings, infrastructure to support energy development, roads, and other anthropogenic features; motorized and nonmotorized recreational use; and activities such as well drilling,

operation, and maintenance, which would entail significant human presence, noise, and infrastructure; and actions, intentional or otherwise, that would result in the destruction of eggs or active nests or cause mortality or injury to chicks, juveniles, or adult lesser prairie-chickens. Regulating these activities would slow the rate of habitat loss, fragmentation, and degradation and decrease synergistic, negative effects from other threats.

Under the Act, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulation at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating take would help slow the rate of habitat loss, fragmentation, and degradation and decrease synergistic, negative effects from other threats.

We may issue permits to carry out otherwise prohibited activities, including those described above, involving threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.32. With regard to threatened wildlife, a permit may be issued for the following purposes: for scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act. There are also certain statutory exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

We recognize the special and unique relationship with our State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist the Services in implementing all aspects

of the Act. In this regard, section 6 of the Act provides that the Services shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, would be able to conduct activities designed to conserve the Northern DPS of the lesser prairie-chicken that may result in otherwise prohibited take without additional authorization.

Nothing in this proposed 4(d) rule would change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the Northern DPS of the lesser prairie-chicken. However, interagency cooperation may be further streamlined through planned programmatic consultations for the species between Federal agencies and the Service, where appropriate. We ask the public, particularly State agencies and other interested stakeholders that may be affected by the proposed 4(d) rule, to provide comments and suggestions regarding additional guidance and methods that the Service could provide or use, respectively, to streamline the implementation of this proposed 4(d) rule (see **Information Requested**, above).

III. Critical Habitat

Background

Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features

(a) Essential to the conservation of the species, and

(b) Which may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as an area that may generally be delineated around species' occurrences, as determined by the Secretary (i.e., range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (e.g., migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that Federal agencies ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Designation also does not allow the government or public to access private lands, nor does designation require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Where a landowner requests Federal agency

funding or authorization for an action that may affect a listed species or critical habitat, the Federal agency would be required to consult with the Service under section 7(a)(2) of the Act. However, even if the Service were to conclude that the proposed activity would result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must implement "reasonable and prudent alternatives" to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the extent known using the best scientific and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical or biological features that occur in specific occupied areas, we focus on the specific features that are essential to support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity.

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation

of the species. When designating critical habitat, the Secretary will first evaluate areas occupied by the species. The Secretary will only consider unoccupied areas to be essential where a critical habitat designation limited to geographical areas occupied by the species would be inadequate to ensure the conservation of the species. In addition, for an unoccupied area to be considered essential, the Secretary must determine that there is a reasonable certainty both that the area will contribute to the conservation of the species and that the area contains one or more of those physical or biological features essential to the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the *Federal Register* on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106-554; H.R. 5658)), and our associated Information Quality Guidelines provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information from the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in section 9 of the Act. Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans, or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

Prudency Determination

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the maximum extent prudent and determinable, the Secretary shall designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations (50 CFR 424.12(a)(1)) state that the Secretary may, but is not required to, determine that a designation would not be prudent in the following circumstances:

(i) The species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species;

(ii) The present or threatened destruction, modification, or curtailment of a species' habitat or range is not a threat to the species, or threats to the species' habitat stem solely from causes that cannot be addressed through management actions resulting from consultations under section 7(a)(2) of the Act;

(iii) Areas within the jurisdiction of the United States provide no more than negligible conservation value, if any, for a species occurring primarily outside the jurisdiction of the United States;

(iv) No areas meet the definition of critical habitat; or

(v) The Secretary otherwise determines that designation of critical habitat would not be prudent based on the best scientific data available.

As discussed earlier in this document, there is currently no imminent threat of collection or vandalism identified under Factor B for either the Northern DPS or the Southern DPS of the lesser prairie-chicken, and identification and mapping of critical habitat is not expected to initiate any such threat. In our SSA report and proposed listing determination for both the Northern and Southern DPSs, we determined that the present or threatened destruction, modification, or curtailment of habitat or range is a threat to the two DPSs and that the threat in some way can be addressed by section 7(a)(2) consultation measures. The two DPSs occur wholly in the jurisdiction of the United States, and we are able to identify areas that meet the definition of critical habitat. Therefore, because none of the circumstances enumerated in our regulations at 50 CFR 424.12(a)(1) have been met and because there are no other circumstances the Secretary has identified for which this designation of critical habitat would be not prudent, we have determined that the designation of critical habitat is prudent for both DPSs of the lesser prairie-chicken.

Critical Habitat Determinability

Having determined that designation is prudent, under section 4(a)(3) of the Act we must find whether critical habitat for the Northern DPS and the Southern DPS of lesser prairie-chicken is determinable. Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

(i) Data sufficient to perform required analyses are lacking, or

(ii) The biological needs of the species are not sufficiently well known to identify any area that meets the definition of "critical habitat."

We reviewed the available information pertaining to the biological needs of the species and habitat characteristics where this species is located and data that would be needed to perform other required analyses. A careful assessment of the economic impacts that may occur due to a critical habitat designation is not yet complete, and we are in the process of working with the States and other partners in acquiring the complex information needed to perform that assessment. Because the information sufficient to perform a required analysis of the impacts of the designation is lacking, we therefore conclude that the designation of critical habitat for both the Southern DPS and the Northern DPS of the lesser prairie-chicken to be not determinable at this time. The Act allows the Service an additional year to publish a critical habitat designation that is not determinable at the time of listing (16 U.S.C. 1533(b)(6)(C)(ii)).

Public Hearings

We have scheduled two public informational meeting with public hearings on this proposed rule for the lesser prairie-chicken. We will hold the public informational meetings and public hearings on the dates and at the times listed above under *Public informational meeting and public hearing* in **DATES**. We are holding the public informational meetings and public hearings via the Zoom online video platform and via teleconference so that participants can attend remotely. For security purposes, registration

is required. To listen and view the meeting and hearing via Zoom, listen to the meeting and hearing by telephone, or provide oral public comments at the public hearing by Zoom or telephone, you must register. For information on how to register, or if you encounter problems joining Zoom the day of the meeting, visit *https://www.fws.gov/southwest/*. Registrants will receive the Zoom link and the telephone number for the public informational meetings and public hearings. If applicable, interested members of the public not familiar with the Zoom platform should view the Zoom video tutorials *(https://support.zoom.us/hc/en-us/articles/206618765-Zoom-video-tutorials*) prior to the public informational meetings and public hearings.

The public hearings will provide interested parties an opportunity to present verbal testimony (formal, oral comments) regarding this proposed rule. While the public informational meetings will be an opportunity for dialogue with the Service, the public hearings are not: They are a forum for accepting formal verbal testimony. In the event there is a large attendance, the time allotted for oral statements may be limited. Therefore, anyone wishing to make an oral statement at the public hearings for the record is encouraged to provide a prepared written copy of their statement to us through the Federal eRulemaking Portal, or U.S. mail (see ADDRESSES, above). There are no limits on the length of written comments submitted to us. Anyone wishing to make an oral statement at the public hearings must register before the hearing (*https://www.fws.gov/southwest/*). The use of a virtual public hearing is consistent with our regulations at 50 CFR 424.16(c)(3).

Required Determinations

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in **ADDRESSES**. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act (42 U.S.C. 4321 et seq.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.), need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the *Federal Register* on October 25, 1983 (48 FR 49244).

Government-to-Government Relationship with Tribes

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial Order 3206 of June 5,

1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We solicited information from all of the Tribes within the entire range of the lesser prairie-chicken to inform the development of the SSA report, and notified Tribes of our upcoming proposed listing determination. We also provided these Tribes the opportunity to review a draft of the SSA report and provide input prior to making our proposed determination on the status of the lesser prairie-chicken but did not receive any responses. We will continue to coordinate with affected Tribes throughout the listing process as appropriate.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* and upon request from the Arlington Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this proposed rule are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Arlington Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS

1. The authority citation for part 17 continues to read as follows:

AUTHORITY: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

2. In § 17.11(h) amend the table by adding an entry for "Prairie-chicken, lesser [Northern DPS]" and an entry for "Prairie-chicken, lesser [Southern DPS]" in alphabetical order under BIRDS to read as follows:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
* * * * * * *				
BIRDS				
* * * * * * *				
Prairie-chicken, lesser [Northern DPS]	*Tympanuchus pallidicinctus*	U.S.A. (All lesser prairie-chickens north of a line starting at 37.9868 N, 105.0133 W, and ending at 31.7351 N, 98.3773 W, NAD83; see map at § 17.41(k))	T	[*Federal Register* citation when published as a final rule]; 50 CFR 17.41(k).[4d]
Prairie-chicken, lesser [Southern DPS]	*Tympanuchus pallidicinctus*	U.S.A. (All lesser prairie-chickens north of a line starting at 37.9868 N, 105.0133 W, and ending at 31.7351 N, 98.3773 W, NAD83; see map at § 17.41(k))	E	[*Federal Register* citation when published as a final rule].
* * * * * * *				

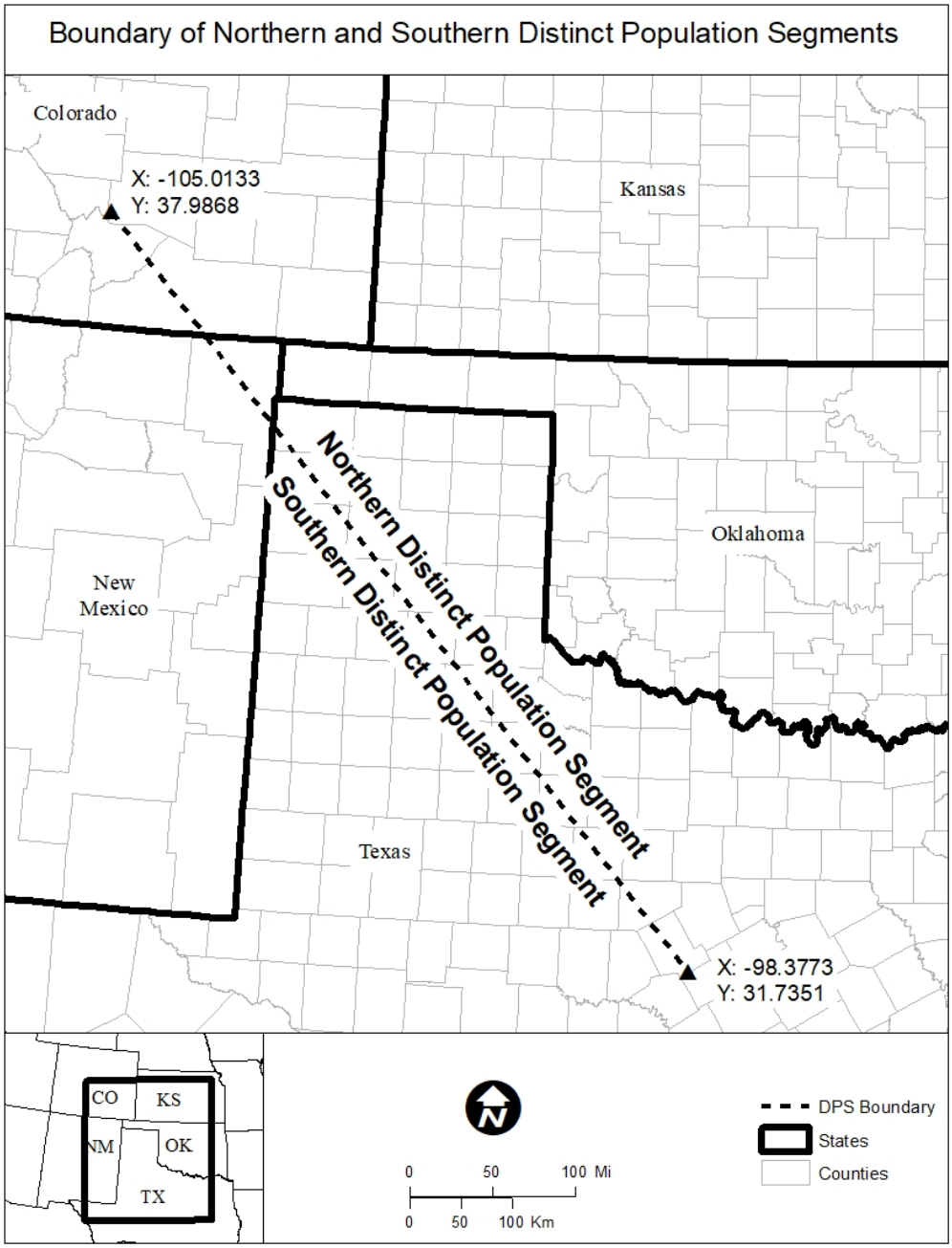
3. Amend § 17.41 by adding paragraph (k) to read as follows:

§ 17.41 Special rules—birds.

* * * * *

(k) Lesser prairie-chicken *(Tympanuchus pallidicinctus)*, Northern Distinct Population Segment (DPS). The Northern DPS of the lesser prairie-chicken pertains to lesser prairie-chickens found northeast of a line starting in Colorado at 37.9868 N, 105.0133 W, going through northeastern New Mexico, and ending in Texas at 31.7351 N, 98.3773 W, NAD83, as shown in the map:

Figure 1 to paragraph (k)



(1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to the Northern DPS of the lesser prairie-chicken. Except as provided under paragraph (k)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to be committed, any of the following acts in regard to this species:

(i) Import or export, as set forth at § 17.21(b) for endangered wildlife.

(ii) Take, as set forth at § 17.21(c)(1) for endangered wildlife.

(iii) Possession and other acts with unlawfully taken specimens, as set forth at § 17.21(d)(1) for endangered wildlife.

(iv) Interstate or foreign commerce in the course of a commercial activity, as set forth at § 17.21(e) for endangered wildlife.

(v) Sale or offer for sale, as set forth at § 17.21(f) for endangered wildlife.

(2) *Exception*s *from prohibitions.* In regard to this species, you may:

(i) Conduct activities as authorized by a permit under §17.32.

(ii) Take, as set forth at § 17.21(c)(2) through (c)(4) for endangered wildlife.

(iii) Take as set forth at § 17.31(b).

(iv) Take incidental to an otherwise lawful activity caused by:

(A) Continuation of routine agricultural practices on existing cultivated lands, including:

(*1*) Plowing, drilling, disking, mowing, or other mechanical manipulation and management of lands;

(*2*) Routine activities in direct support of cultivated agriculture, including replacement, upgrades, maintenance, and operation of existing infrastructure such as buildings, irrigation conveyance structures, fences, and roads; and

(*3*) Use of chemicals in direct support of cultivated agriculture when done in accordance with label recommendations.

(B) Implementation of prescribed fire for the purposes of grassland management, including:

(*1*) Construction and maintenance of fuel breaks;

(*2*) Planning needed for application of prescribed fire;

(*3*) Implementation of the fire and all associated actions; and

(*4*) Any necessary monitoring and followup actions.

(v) Possess and engage in other acts with unlawfully taken wildlife, as set forth at § 17.21(d)(2) for endangered wildlife.

Martha Williams,
Principal Deputy Director,
Exercising the Delegated Authority of the Director,
U.S. Fish and Wildlife Service.

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